

AN INVESTIGATION INTO HORTICULTURE AS A PREVOCATIONAL TRAINING

TOOL FOR THE E.M.R. STUDENT,

by

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ABSTRACT	

INTRODUCTION

Vocational preparation is a primary focus in the rehabilitation and education of the Educable Mentally Retarded (E.M.R.) today. Educators have begun to recognize that the potential of these individuals can only be realized through adequate vocational education and training (20,50). Recent appropriations of Federal monies have been allocated for the express purpose of meeting the vocational needs of the retarded (15). This sector of the handicapped population have valuable contributions to make to the community and job market (15,59).

Public educators shoulder much of the responsibility for the occupational preparation of the E.M.R. youth. Curriculum restructure in the special education program has resulted in increased emphasis on career exploration, and prevocational training. Students are exposed to a variety of vocations, and are encouraged to look beyond the traditional roles of custodian, dishwasher, and assembly-line worker (14,61).

Horticulture has captured the vocational interests of many retarded today. Various training facilities, sheltered workshops, and demonstration studies have shown that horticulture is an exceptional training medium for the retarded (8,13,24). Training centers, such as Melwood Horticultural Training Center, Inc. in Upper Marlboro, Maryland, have successfully placed retarded trainees in many horticultural positions in the community. Trainees have filled jobs in greenhouses, floral shops, forestry and park services, arboretums, landscape and maintenance firms, garden centers, and nurseries (46,56).

Objectives

The purpose of this study was to develop and evaluate a prevocational horticulture training program for the E.M.R. student enrolled in a special education program. The objectives included: 1) development of a horticulture instructional unit, consisting of five related lesson plans, 2) evaluation of its effectiveness as a prevocational training tool for the E.M.R. student, 3) assessment of ease of implementation and execution by the special education teacher, and 4) modification and revision of the unit based on the evaluations.

Need for the Study

It has been found that there is a need for the E.M.R. student to receive prevocational training before entry into a regular vocational program (11,18,19,25,26,50). Although horticulture has been cited as an exemplary vocational program for the retarded (52,54,60), little documentation of horticulture prevocational programs for the E.M.R. student exists. There is an absence of specific training techniques available in the literature, and the limited information in prevocational horticulture instructional guides is very general, and broad in scope (2,3,4,13,38).

Based on the noticeable lack of specific prevocational training techniques in horticulture for the E.M.R. student, and the non-existence of step-by-step training guides, it was determined that a need for this study existed.

Definition of Terms

For the purposes of this study, the following terms will be defined as follows:

1. E.M.R. - an Educable Mentally Retarded individual with an I.Q. in the range of 50-75.
2. Prevocational horticulture training program - introductory horticulture education and instruction which prepares students for, and precedes entry into a regular vocational program.

Assumptions

In conjunction with the development of the instructional unit, the following assumptions were made:

1. The special education teacher has no prior knowledge of, or experience in horticulture.
2. The unit will provide activities and instructional material for one fifty-minute session each day, over a ten week period.
3. The special education classroom has no laboratory facilities, and may lack windows.
4. High school special education E.M.R. students, expecting to eventually enter a regular vocational program, have no prior knowledge of, or experience in, horticulture.

Limitations

The following limitations should be considered when drawing conclusions from this study:

1. One special education class participated in the study. No other comparison or control groups were used.
2. One special education teacher assessed the ease of implementation and execution of the instructional unit.
3. Four male E.M.R. students participated in the study. This small sample number made statistical measurement of the experiment invalid.
4. The time factor involved in the development, execution, and modification of the unit made evaluation in other classroom situations, and follow-up studies of it infeasible.
5. Many variables were involved, making analysis of the direct impact of the horticulture unit on change in student skill and attitude acquisition difficult.

REVIEW OF LITERATURE

The Vocational Potential of the Mentally Retarded

The prevalence of mental retardation in the general population is approximately three percent. The great majority (89%) of this group fall into the mildly retarded classification with an I.Q. range of 50-55 - 70-75 (15). They are usually categorized as Educable Mentally Retarded (E.M.R.) within the public school system scheme of compartmentalization (11,21). In 1972-1973, 826,177 mentally retarded students were enrolled in public schools, the ratio of mentally retarded to all students enrolled, expressed as a percent, being approximately 1.77% (49).

Despite traditional viewpoints, this minority group can expect to hold a functional place in society. In a recent article on the employment outlook for the retarded, the President's Committee on Mental Retardation predicts "promising opportunities if counselors and employers have the vision to create them (44)." DiMichael (1967) states that there are probably more jobs for the retarded than there are retarded to fill them (23). Fenton and Thompson (1967) report that a review of New York State's civil service system revealed 13,000 potential jobs suitable for the retarded (27). Also optimistic about occupational opportunities for the retarded, Nayowith (1970) indicates that there is an increasing shortage of unskilled workers in many occupations, which could be alleviated by hiring the mentally retarded (48). Employers are becoming more open-minded about this group of

individuals (55). Studies have shown that the retarded can perform a variety of tasks; that they are conscientious workers; and that they can successfully complete the job (59). Identification of occupations the retarded can perform, and appropriate training techniques will assure effective competition by the retarded worker in the labor market (15).

The Role of Vocational Education in Preparing the Retarded for Job Entry

Vocational education has the potential to change the lives of the mentally retarded. As public educators make occupational training programs accessible to this group of handicapped, there will be a resultant reduction in their dependency on their family and the community (20,50).

Until recently, vocational education programs offered little for the retarded. However, passage of the Vocational Education Act of 1963, and its 1968 amendments have altered this. Public school systems are now responsible for much of the vocational preparation of the E.M.R. student (15).

Most E.M.R. students are placed in some type of special education program in the public school, depending on the types of curriculums offered. Here, the emphasis is shifting from academic to vocational programs. Special education teachers are still trained to teach primarily academic skills, but should be prepared to provide considerable instruction in the occupational area (14). A recent study of secondary special education teachers reveals their beliefs that the vocational

area needs the greatest attention in the high school curriculum (15). It is recognized that the E.M.R. student is able to function effectively in the community, provided he obtains adequate job skills and attitudes in the vocational program. The major objective, then, in the education of the E.M.R. student is achievement of some degree of vocational competence (35). Eskridge and Partridge (26) support the contention that special education classes need well organized vocational education programs.

Prevocational Training for the E.M.R. Student

Specific functions of the special education class with regard to vocational education of the E.M.R. student vary considerably from one school system to another. Many curriculums have been designed with the concept of using the special education class for purposes of career education and introductory occupational skills' acquisition (18,50). English and Browning (25),and Baroff (11) emphasize the need for the mentally retarded to receive prevocational education and training before they finish school and begin to receive vocational rehabilitation services. Frequently, E.M.R. students between the ages of thirteen and fifteen are placed in self-contained classrooms designated as a prevocational class. This prevocational instruction facilitates vocational adjustment (18,26),and enables the E.M.R. student to successfully compete with his 'normal' peers in a regular vocational program (19). Prevocational programs should be exploratory in nature, preparing the student to make a smooth transition to a regular vocational program (50).

Some of the purposes of this training period include: occupational exploration; evaluation of the trainee; social and personal relationship development; good work habits and attitudes achievement; work confidence and tolerance acquisition; and preliminary skill development (18,50,65).

Horticulture as a Vocational Program for the Retarded

With regard to vocational and occupational preference, the retarded individual has traditionally been stereotyped and ushered into positions such as janitors, dishwashers, and assembly-line workers. Such stereotyping represents the lack of consideration for the retarded individual's interests and aptitudes (18). A 1972 publication by the U. S. Department of Health, Education, and Welfare (61), indicates, however, that horizons in vocational education for the retarded are broadening as recommended occupational offerings become more diversified.

One of the more recent vocational areas to gain attention and recognition is horticulture. It has been cited as an exemplary vocational program for the retarded (52,54,60). Vocational training programs, such as the Calhoun Area Vocational Center in Battle Creek, Michigan (50), the Training School at Vineland, New Jersey (22), and others (51,57), have utilized horticulture. Among the more outstanding horticulture training programs in operation are Melwood Horticultural Training Center, Inc. in Upper Marlboro, Maryland (24), Sunland Center in Marianna, Florida (13), and The Bancroft Community in Mullica Hill, New Jersey (8).

History of Horticulture as a Training Tool for the Retarded

Horticulture as a rehabilitative tool is not a new idea. E. R. Johnston (36), in 1899, cited in the Journal of Psychoasthenics that plants and gardens were used to enhance learning by mentally handicapped children. He goes on to say that:

"In the garden every sense is alert. How the eye brightens at the masses of gorgeous color and the beautiful outlines - How many things, hot and cool rough and smooth, hard and soft, and of different forms are to be grasped and held by trembling uncertain hands whose sense of touch is hardly yet awakened."

G. M. Lawrence (39), in a paper, "Principles of Education for the Feeble-Minded" (1900), writes in the same journal:

"Don't talk to the child about numbers; but while he is learning to distinguish one flower from another, he will unconsciously learn the number of leaves, petals, etc. And, of course, a very dull child will take pride in having more flowers in his own garden than a playmate has in his."

By the 1950's, horticulture was used as a vocational training medium for the retarded in sheltered workshops, institutions, and on farms (5,52,57). Today, horticulture as a rehabilitative training tool for the mentally handicapped has gained international recognition due to the efforts of the National Council for Therapy and Rehabilitation through Horticulture. Recent research papers and demonstration studies recommend horticulture as a valuable training tool and vocational education program for the mentally retarded (29,31,34,46).

Benefits of Horticulture as a Training Medium for the Retarded

Horticulture has gained attention and recognition as an effective training medium for the mentally retarded for several reasons. One reason is that it possesses motivational qualities. Jordan and DeCharms (37) note that the achievement motive in retarded children is inferior to that of normal children. This means that special motivational methods must be employed to compensate for this deficiency if learning is to be accomplished. The staff at Sunland Center contend that the primary challenge in working with the mentally retarded is motivation. They report that horticulture has proven to be an unusually successful motivational medium (13). Likewise, W. Wochler (66), in an article "Teaching the Disadvantaged and Handicapped", concludes that the most important element to a vocational program is motivation. Furthermore, he states that:

"Working with the soil and following the cycles of the plant world upon which man is so dependent, bring an involvement and awareness of everything around us. Students who are turned off academically, but who have had an opportunity to express their latent artistic abilities by being exposed to experiences in working with live and/or dried floral materials, invariably bring home coveted awards from shows, exhibits, and contests. The satisfaction derived by both the student and the teacher is immeasurable... Students who are enrolled in agriculture programs gain profoundly from such a curriculum. It appears to provide a tangible link between the student and his environment."

H. Brooks of the Institute for Rehabilitation Medicine at New York University Medical Center observes that working with plants may pro-

vide motivation and initiate response because gardening is not a static activity - there is always something happening (40).

Horticulture has other benefits, also. Earl Copus, Jr., Director of the Melwood Horticultural Training Center, Inc., states:

"At Melwood, we've found that horticulture has more to interest the handicapped because it is not a routine, mechanical activity, such as stamping out parts of a product or similar functions performed in sheltered workshops (1)."

Lewis (41), writing in "Human Perspectives in Horticulture," contends that the success of horticulture as a rehabilitative medium lies in the idea that plants are non-threatening and non-discriminating entities in a constantly judgemental world. Rather than responding to intellectual or physical capacities of the gardener, plants respond only to the care they receive. In another of his articles, "People/Plant Interaction: Human Perspectives in Horticulture" (42), he indicates that horticulture helps to alleviate social, psychological, and physical stress.

P. D. Hefley (32) cites the following benefits of horticulture for the retarded in "Horticulture: A Therapeutic Tool":

1. Intellectual benefits: attainment of new skills; improved vocabulary and communication skills; an aroused sense of curiosity; increased powers of observation; vocational and pre-vocational training; and stimulation of sensory perception.
2. Social benefits: interaction within a group; interaction outside of a group.

3. Benefits of emotional growth: improved self-confidence and self-esteem; opportunities for release of aggressive drives; enthusiasm for the future through interest-promoting activities; opportunities for satisfying creative drives.
4. Physical benefits: development and improvement of basic motor skills; increased outdoor activities.

The philosophy of Ken Stoutamire, director of horticultural therapy at Sunland Center (13), concerning the value of horticulture versus other training mediums for the retarded is expressed in the following:

"...the retarded are being trained in a profession which is realistic in relation to their capabilities...A strong bond is formed when a person assists a seed in the tenure journey toward maturity. Paradoxically, the person will find that, like the plant, he has grown. His senses become more attuned to his environment. His self-confidence increases as he attributes much of the plant's success to his own efforts. He sees that the work which he has invested is for a very definite reason... The self-confidence derived by a retarded citizen through successive positive experiences with the earth and her products contributes to developing better social relationships, greater reliability, more initiative, and ultimately, employability."

Utilization of Horticulture in Special Education

Within the special education programs of the public school system, horticulture has been used in various capacities with the retarded as a vocational education tool. Wallin (63) advocates that the program of avocational training within the curriculum of the special education class should include, whenever possible, the rudiments of horticulture

as a type of life-adjustment experience. The Special Education Program of the Santa Monica High School in California has utilized horticulture in its work-experience programs for retarded students (62). In a 1962-1963 Texas state-wide Cooperative Program of Special Education - Vocational Rehabilitation in the public schools, a survey was made to determine the types of jobs that E.M.R. students were assigned to for on-the-job training. Results of the survey indicated that 2.52% of the E.M.R. students were successfully placed and trained in agriculture and horticulture (60). Merced County Department of Education, Merced, California, was awarded a three year grant in 1972 to explore the careers in horticulture for the retarded and physically handicapped. Students involved in this study are being given individualized training in designated facets of horticulture with the objective of determining competence and interests for future employment (58). A successful special education program integrating ornamental horticulture was begun during the 1967-1968 school year at Mount Anthony Union High School in Bennington, Vermont. The administration observed that certain qualities of the mentally handicapped students became evident through this program - improved social attitudes, improved self-concept, and a sense of personal pride (45). C. R. Chandler (17), relates how she uses horticulture in her special education classes for Trainable Mentally Retarded students. Her students acquired many skills through the program, along with such other benefits as self-realization, and development of efficient work habits.

Another successful special education program for the retarded utilizing horticulture is the Charles Lea Center in Spartansburg, South Carolina. The program includes prevocational, vocational, and therapy programs. Objectives of the program are to use horticulture as a vehicle to teach, inspire, and promote self-awareness and self-esteem. Ultimate goals include vocational preparation for specific occupations in horticulture (38). The Allegheny County (Pennsylvania) school system operates a horticulture program designed specifically to bridge the gap between the E.M.R. special education classroom and the Horticulture Vocational Training Program. The E.M.R. teacher is provided with a guide and asked to assist in the development of prerequisite skills for the students. The teacher is not asked to teach the subject of horticulture as outlined for regular vocational horticulture instructors. Objectives of the program include: development of an awareness of horticulture in the home and in daily living; development of prerequisite skills for employment in the community; and development of basic skills necessary for further horticulture study. The guide is broad in nature and covers math, language, and other concepts as related to horticulture (2).

A similar curriculum guide, "Preparing E.M.R. Students for Vocational Horticulture," (4) has been developed by Virginia's Division of Vocational Education to assist secondary school teachers. It's objectives are the same as those in the Allegheny program, and its information is very general and broad in scope.

Lack of Definable Training Techniques in Horticulture Programs
for the E.M.R. Student

Gold (28), reviewing the literature on vocational training for the retarded, finds that there is a noticeable lack of definable training techniques, despite the surprising frequency with which they are mentioned. He finds that no specific vocational training systems are currently available. Literature reviewed for this study also reveals that the curriculum structure of the horticulture training programs for the E.M.R. student are very general, and do not include step-by-step approaches to task skills (2,3,4,13,38).

It is evident from the above literature, that training programs in horticulture for the E.M.R. student are recognized, and have existed for some time. However, specifics of the training techniques are neither well devised nor readily documented in the literature. Curriculum guides for implementation of special education prevocational training for the E.M.R. student is even less available. Horticultural training units consisting of specific, step-by-step skills' procedures are much needed, but are virtually non-existent.

RESEARCH METHODOLOGY

This study developed, and attempted to evaluate a horticulture prevocational training unit for the E.M.R. student enrolled in special education at the high school level. There were four objectives to the study: 1) development of a horticultural training unit comprised of five related lesson plans, 2) assessment of its effectiveness as a prevocational training tool for the E.M.R. student planning to enter a regular vocational program, 3) assessment of its ease of implementation and execution by the special education teacher, and 4) revision of the unit based on evaluations and recommendations.

Sample Population

One special education class in the Montgomery County School system (Blacksburg High School, Blacksburg, Virginia) taught by special education teacher, Lynda Moore, was used in this study. Four male E.M.R. students, ranging in age from 15-16 years, participated.

Research Approach and Criteria for Evaluation

The development, evaluation, and subsequent revision of a horticulture instructional unit, composed of five related, step-by-step lesson plans (appendix 1), was a primary component of this study. Assessment of the lesson plan content and format was determined by written and verbal evaluations of the teacher, and by classroom observations of their implementation by the researcher.

To help determine the unit's effectiveness as a prevocational training tool, the One-group Pretest-Posttest Pre-experimental Design

was employed (16). A pre-evaluation was developed by the researcher based on similar evaluations prepared by Melwood Horticultural Training Center, Inc. (46), and Sunland Training Center (9). This Attitudes' and Skills' Evaluation (appendix 2) was first made on one group of E.M.R. students to determine their level of job skills and attitudes. This group then received the treatment, ten weeks of instruction and training in horticulture based on the prevocational instructional unit. The same evaluation form was used at the end of the ten week period to determine change in student skill and attitude acquisition. Evaluation scores for each student were totaled, and percentage change in pre and post scores was calculated. Mean scores for the group were determined and compared.

In addition to the Pre-experimental Design, other methods were employed to further assess the effectiveness of the unit. Classroom observation was employed to evaluate emotional, social, intellectual, physical, and skills' competency changes in the students. Student achievement on Performance Objectives stated in the lesson plans, and student performance on related classroom assignments, such as worksheets, were also used as evaluation measurements.

Observational evaluation and recommendations made by the teacher were the assessment methods employed to determine the ease of implementation and execution of the unit by the special education teacher.

Assumptions

In the design of the unit, the following assumptions were made:

1. The special education teacher has no prior knowledge of, or experience in, horticulture.
2. The unit will provide activities and instructional material for one fifty-minute session over a ten week school period.
3. The special education classroom has no laboratory or greenhouse facilities, and may lack windows.
4. High school special education E.M.R. students, expecting to eventually enter a regular vocational program, have no prior knowledge of, or experience in, horticulture.

Furthermore, the above assumptions necessitated that the choice of plant material for the lesson plan topics comply with the following:

1. The plants grown respond well to artificial lighting as their only source of illumination.
2. The plants grown must all require approximately the same temperature, humidity, and light intensity range.
3. The plant growth cycles must be synchronized such that the lesson plan topics overlap for continuous activity for the ten week period.
4. Plant material must be easy to grow, assuring the student some success with the culture.
5. Culture of the plant material must utilize materials that are relatively inexpensive, portable, and readily transported.

Procedures

The determining criteria for development of a horticulture training unit for the Educable Mentally Retarded were established. Contact was

made with local health and public school officials to locate possible research sites to evaluate the training material. Blacksburg High School in Montgomery County, Virginia was selected as the research site. Mrs. Lynda Moore, E.M.R. special education teacher at the school, agreed to help implement and evaluate the prevocational horticulture instructional program for a ten week period. Three lesson plans were then formalized for use in the study. Two additional lesson plans were developed during the ten week period. A preliminary evaluation of the E.M.R. students participating in the study was made through the Attitudes' and Skills' Evaluation (appendix 2). Execution of the instructional unit occurred over the following ten weeks. At the end of this period, a post-evaluation of the students was made through the same Attitudes' and Skills' Evaluation. Final evaluations were used as the basis for modifications and adaptations of the lesson plans.

When initial investigation of criteria for developing the instructional unit was made (2,3,54), the following components were identified as useful for the special education teacher's understanding in executing the lesson plans:

1. Program Title, Unit, and Topic Area stated at the beginning of each lesson plan.
2. A description of the classroom situation in the introduction to the unit which states that:
 - a. Students are classified as E.M.R., and are enrolled in a special education program.

- b. Instruction of this unit will be carried out by the special education teacher who has no prior knowledge of, or experience in, horticulture.
 - c. The lesson plans can be carried out in a regular classroom setting. No laboratory or greenhouse facilities or windows are needed.
 - d. The students will eventually enter a regular vocational program.
3. A list of General Objectives in the unit introduction. These objectives are concerned with the following (2,4,38,46):
- a. Acquiring a general knowledge of horticulture before entering a regular vocational program.
 - b. Improving mental skills.
 - c. Learning appropriate social interaction.
 - d. Increasing responsibility.
 - e. Enhancing awareness of surroundings and self.
 - f. Improving self-confidence.
 - g. Acquiring good work habits and attitudes.
4. A list of specific Performance Objectives in each lesson plan. The objective clearly specifies the observable behaviors which the student will learn and demonstrate as a result of the instructional lesson, and the conditions under which the student will perform it (2,3,4,6,38,46). These objectives are concerned with the following skills: gross motor coordination; fine motor coordination; simple judgement; complex judgement; social

interaction; mathematics; verbalization; visual perception; sensory perception; memory; reading; and writing.

5. A Teaching Outline for each lesson plan with step-by-step written and illustrated instructions for completing each Performance Objective.
6. A list of Related Events and Activities suggested to accompany each lesson plan.
7. A list of Supplementary References and Teaching Aids for each lesson plan at the end of the unit.

Implementation and evaluation of the lesson plans began on March 15, 1977 at Blacksburg High School under the direction of special education teacher, Lynda Moore, and the researcher. Mrs. Moore was provided with all the materials required to complete the unit. She was instructed to familiarize herself with the lesson plans, complete a pre-training Attitudes' and Skills' Evaluation for each student, then begin implementation of lesson plan #1, "Sprouting Mung Beans" (appendix 1A). Utilization of the other four lesson plans was to be synchronized and overlapped so that continuous activity would be provided. Mrs. Moore was directed to use the instructional package for one fifty-minute class period a day for the next ten school weeks. The researcher assisted with the teaching on Tuesdays and Thursdays, establishing relationships with the students, clarifying problem areas, observing and recording student progress, and evaluating and revising instructional material. At the end of the ten week period, the teacher was asked to complete a post-

training Attitudes' and Skills' Evaluation for each student. Final evaluations and modifications of the instructional package were made at this time.

The special education classroom was small, carpeted, windowless, contained no laboratory facilities, had little ventilation, and remained a constant temperature of approximately 75^oF. The students worked on a large table on which the 36", two bulb Gro-lite, and the other instructional materials were located.

Four male students participated in the program. Their individual I.Q. scores could not be released due to the Freedom of Information Act. However, they had been diagnosed as Educable Mentally Retarded. All were enrolled in the special education program at the high school. None had received prior instruction in horticulture, though one student had worked as an assistant with a landscaping firm. The students were to enter a regular vocational program (not necessarily horticulture) the next school year.

Student Achievement on Performance Objectives and Related Classroom Assignments

Based on results from written, oral, and performance tests administered to the students, and on their performance on related assignments such as worksheets, it was concluded that the students did accomplish the Performance Objectives listed in the lesson plans. Skill acquisition occurred in accordance with the Performance Objectives. The following Performance Objectives give examples of how activities were used to promote specific skill acquisition by the students:

<u>Skill</u>	<u>Performance Objective</u>
1. Gross motor coordination	The student will be able to correctly scoop up a handful of Jiffy-Mix.
2. Fine motor coordination	The student will be able to sprinkle the fine coleus seed in a row.
3. Simple judgement	The student will be able to correctly fill his pot with potting soil.
4. Complex judgement	The student will be able to correctly set a Gro-lite timer.
5. Reading	The student will be able to determine the kind of plant he will be growing by reading his seed packet.
6. Verbalization	The student will be able to verbally explain what an annual is.
7. Memory	The student will be able to verbally list five seeds that are good for sprouting in addition to Mung beans.
8. Writing	The student will be able to write his name, the plant, and the date correctly on a label.
9. Mathematics	The student will be able to measure four cups of water, and determine that they are equal to one quart.
10. Visual perception	The student will be able to correctly center a square of cheesecloth over the mouth of the jar.
11. Sensory perception	The student will be able to determine by visually inspecting the plant, and handling the pot, when the Nasturtiums need watering.
12. Social interaction	The student will be able to, working with a partner, secure the cheesecloth over the mouth of the jar with a rubber band.

RESULTS AND DISCUSSION

The results of this study focus on the discussion of four components: 1) evaluation of the individual lesson plans, and their ease of execution by the teacher, 2) assessment of the effectiveness of the entire training program based on results derived from the One-group Pretest-Posttest Pre-experimental Design, 3) assessment of the program based on subjective classroom observation of student performance, and 4) assessment of the program based on student achievement of Performance Objectives, and performance on related classroom assignments. The revised lesson plans are included in the appendices.

Evaluation of the Lesson Plans, and Their Ease of Execution

Based on written and verbal assessments of Mrs. Moore, and on classroom observations of their implementation by the researcher, it was found that the lesson plans required little modification with regard to the Teaching Outline format, and step-by-step sequences. The outline was clear, easy to follow, and contained the information necessary for the teacher to effectively provide instruction in the Topic Areas. The illustrations proved especially beneficial in clarifying the procedures. Listing materials adjacent to each step provided ease and order to the execution.

Originally, the Performance Objectives were listed at the beginning of the lesson, with the skills involved in completing each objective stated respectively. This was shown to be unnecessary for effective execution of the instructional material. A list of Skills Involved in

Completing the Performance Objectives was instead included at the beginning of the lesson plans, and Performance Objectives were stated adjacent to the step-by-step procedures contained in the Teaching Outline.

It was found that the original list of Problems and Concerns (a question form of the objectives directed to the students), located at the beginning of the lesson plan, was redundant, and was deleted.

The criterion that the lesson plans provide activities and instructional material for one fifty-minute session each day over a ten week period was not met. The original instructional unit provided activities for three fifty-minute sessions each school week instead of five. It cannot be determined from this study whether this condition would hold true for a different teacher and group of E.M.R. students since the study was not replicated in a different group situation. This lack of sufficient activities was resolved during the training period by the addition of supplemental activities and instructional material such as worksheets directly related to the lesson plans. Many of these activities have been incorporated into the Teaching Outline, and the Suggested Activities list at the end of each lesson plan.

It was found that some of the information in the Teaching Outline was too simple and general for the level of the E.M.R. students involved in this study. The students desired more information regarding the following: soil science; plant physiology; fertilization practices; and career opportunities related to horticulture. It cannot be concluded that more detailed information would be required for all E.M.R. students,

however. The instructional unit was modified to incorporate some additions in these areas.

Activities that were of particular interest to the students included: supplemental movies and filmstrips; a field trip to a local retail nursery and the National Forest; construction of macrame hangers for the pots of Nasturtiums and Zinnias; investigation into career opportunities in horticulture and related fields; eating Mung Bean sprouts; and providing care for the plants.

Areas of the unit that the students had difficulty with, and needed additional instructional reinforcement in, included: measurement; labeling; watering practices; keeping record charts; understanding associations in plant growth cultural practices between different plants; remembering step-by-step sequences; spelling; and vocabulary. These problems were alleviated by the addition of certain activities, and repetition of specific steps causing difficulty until the desired performance objective was accomplished.

Results of the One-Group Pretest-Posttest Pre-Experimental Design

Individual total scores tabulated on the Attitudes' and Skills' Evaluation were higher on the post-evaluation than on the pre-evaluation. This numerical increase is indicative of improvement in the attitudes' and skills' areas noted on the form (appendix 2). Wayne L., Brian S., Mike B., and Darell L. showed improvement in total scores of 18.4%, 14.4%, 14.4%, and 5.6%, respectively. Further analysis, comparing mean scores, was made, but due to the small sample number (4), the results

are not statistically valid. The improvement in scores cannot be validly attributed to the treatment (the horticulture instructional program) due to the absence of comparison groups, and the presence of too many variables, such as unrelated concurrent instruction.

Subjective Observational Assessment of Student Performance, and Case Studies

Student accomplishment of the General Objectives was difficult to assess as objective analyses are difficult to employ. Based on subjective observation of student performance by the teacher and the researcher, it was observed that the students exhibited greater responsibility, increased self-confidence, and improved mental skills by the end of the training period. The instructional unit promoted social interaction, and enhanced student awareness of life processes, and self.

It was concluded that the horticulture training program was the agent responsible for the increase in student motivation and interest based on the following: 1) teacher comparisons between the motivational qualities of the horticulture program, and the motivational qualities of other educational activities executed in her classroom, and 2) upon the post-training decisions of three out of the four students to enter a horticulture-related regular vocational program next year. The students found the horticulture instructional material and activities exciting and challenging. Since success in a vocational program is largely dependent on the interest and motivation level of the trainee (12,13,66), it can be concluded that this prevocational training program provided the students with a necessary element for success in a regular vocational program.

Case Study 1

When the program began, Wayne L. (age 16) showed little interest, and was non-verbal in the presence of the researcher. Required skills were performed with great reservation, and he displayed a lack of self-confidence. Wayne's gross and fine motor coordination were poor, and he had difficulty understanding procedures. At the beginning of the unit, he had planned to enter a mechanics program next year. As the unit progressed, Wayne showed more motivation and interest, especially with regard to subjects dealing with vegetable production. He became very verbal, open, and friendly towards the researcher and classmates, talking constantly about his personal experiences with vegetable gardening at home. His confidence in himself and his ability to perform the horticulture skills increased. He participated in class activities freely, and displayed more self-assertion by engaging in discussions. The "hands-on" activities of the program helped Wayne improve his dexterity and coordination. By the end of the ten weeks, he had decided to enter an agriculture machinery program instead of a regular mechanics class.

Case Study 2

Darell L. (age 16) was non-verbal at the onset of the program, and remained non-verbal in the presence of the researcher. He was extremely withdrawn throughout the program, and was frequently absent. He reads only thirty-three words. Darell displayed no interest in the program, and did not participate in any activities in the presence of the researcher during the entire ten weeks. Mrs. Moore related, however, that he

showed interest in the unit in the absence of the researcher, and participated in the activities to a limited extent. She reported that he learned well by experience. Darell dropped out of school towards the end of the ten weeks. Previously, he had planned to enter carpentry next year.

Case Study 3

Brian S. (age 15) showed an immediate interest in horticulture. He had had no prior exposure to the subject or work experience in the field. Initially, he lacked confidence in his ability to perform the required skills. However, towards the end of the unit, he completed the tasks with much authority, and was eager to assist others. Brian remained slow at completing the supplementary worksheets, but his interest in the subject increased his desire to improve his spelling, writing, and reading skills. Motivated by the program, he took initiative to bring in plants from his home yard. As a result of the unit, Brian had decided to enter a horticulture program next year.

Case Study 4

Mike B. (age 15) was the only student with previous experience in horticulture. He had worked as an assistant with a landscaping firm, and was currently enrolled in an agriculture program. Initially, Mike was reluctant to communicate with the researcher. By the end of the ten weeks, however, he had become more verbal, open and friendly. The horticulture program was extremely interesting to Mike, and he displayed increased pride and responsibility for the plant material as the unit

progressed. The horticulture unit served as a motivational tool in that he was eager to participate in all the activities, and was always the first to finish his supplemental assignments. The pre-evaluation indicated that Mike was limited in language arts skills. During the course of the ten weeks, however, he worked hard at these skills by completing the assigned worksheets. The post-evaluation revealed an improvement in this area. Mike has always planned to enter an agriculture program. He does not get along well with the horticulture teacher at the school, so it is doubtful that he will enroll in this field of agriculture next year. Mike will work with a landscaping firm again this summer.

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this study was to develop and evaluate a prevocational horticulture training program for the E.M.R. student enrolled in a special education program. The objectives included: 1) development of a horticultural instructional unit, 2) assessment of its effectiveness as a prevocational training tool for the E.M.R. student, 3) assessment of its ease of execution by the special education teacher, and 4) modification of the unit based on the evaluations.

One E.M.R. special education class at Blacksburg High School, Blacksburg, Virginia, participated in this study. The sample population size was four. Special education teacher, Lynda Moore, with the assistance of the researcher, executed and evaluated the instructional package. Neither the teacher, nor the students, had received prior instruction in horticulture.

The One-Group Pretest-Posttest Pre-experimental Design was employed in this study as part of the assessment of the effectiveness of the instructional unit as a prevocational training tool. The subjects in the study were given a pre-evaluation using an Attitudes' and Skills' Evaluation formulated by the researcher. Subjects then received the treatment, ten weeks of instruction based on five related lesson plans utilizing horticultural topics. A post-evaluation using the same Attitudes' and Skills' Evaluation was made at the end of the ten weeks. Pre and post-evaluation scores were compared.

Additional assessment of the program was based on the evaluation of student skill and attitude acquisition by means of: 1) classroom observation of student performance, 2) level of achievement of Performance Objectives, and by 3) performance on assignments related to the instructional unit. Assessment of the lesson plan content, and their ease of implementation and execution by the teacher was based on classroom observation, and on written and verbal evaluations of the teacher.

Conclusions

Based on observational assessments, degree of student achievement of the Performance Objectives, and student performance on related assignments, the study indicated that the horticulture training program was an effective vocational instructional tool. It promoted good work and social attitudes, improved mental and work skills, increased motivation, and promoted a general knowledge of horticulture.

Improvement in job skills and attitudes of the students did occur based on comparisons between pre and post Attitudes' and Skills' Evaluation scores. However, measurement of the programs' effectiveness as a prevocational training tool, based on the Pre-experimental Design, could not be validly determined due to the small sample number. The lack of comparison groups, and the variables involved in the study, made it difficult to assess whether the horticulture training program was the treatment responsible for the improvement in student skills and attitudes.

Based on the evaluations of the ten week program, the lesson plans were revised to include improvements and suggestions, and to facilitate execution by the teacher. As a research and development study, it was successful, evidenced by the development of a usable product, step-by-step horticultural instructional material for the E.M.R. student.

Recommendations

The findings and procedures of this study indicate that it provides a preliminary framework for further research, experimentation, and investigation into the utilization of horticulture as a prevocational training tool for the E.M.R. student. Replication of the program should be made in a number of E.M.R. classrooms. Comparison or control groups should be used, and a larger sample number should be obtained. Follow-up studies are essential to determine the impact the prevocational program has on the entry and success of the E.M.R. students in a regular vocational program.

LITERATURE CITED

1. Anonymous. 1975. Flowers and plants are used in rehabilitation therapy. Florist, July, (Reprint).
2. _____. 1972. Guide for the Secondary E.M.R. Teacher in Preparing Students for the Vocational Area of Horticulture. Published by Allegheny Exceptional Children's Program, Pennsylvania.
3. _____. 1975. Ornamental Horticulture. Board of Cooperative Educational Services of Nassua County, Westbury, New York.
4. _____. 1976. Preparing E.M.R. Students for Vocational Horticulture. Published by the Division of Vocational Education, Department of Education, Richmond, Virginia.
5. _____. 1970. Rehabilitation in Australia. International Rehabilitation Review 21(3):8-10.
6. _____. Task sheets. Melwood Horticultural Training Center, Inc., Upper Marlboro, Maryland, (Mimeo).
7. _____. 1972. Teacher's Guide for First Grade Plant Growing Project: Nasturtiums. Published by Cleveland Public Schools, Cleveland, Ohio.
8. _____. 1976. The Bancroft Community. National Council for Therapy and Rehabilitation through Horticulture Newsletter 3(5).
9. _____. Vocational inventory sheets. Sunland Center Vocational Training Department, Sunland Training Center, Marianna, Florida.
10. Ball, G., Inc. 1975. The Ball Red Book. George J. Ball, Inc.
11. Baroff, G. S. 1974. Mental Retardation: Nature, Cause, and Management. John Wiley and Sons, New York.
12. Becker, R. L. and R. E. Ferguson. 1967. Vocational picture interest inventory. Columbus State University, Columbus, Ohio.
13. Blackstock, P. Hortitherapy at Sunland Center. Marianna, Florida, (Mimeo).
14. Brolin, D. E. 1973. Career education needs of secondary educable students. Exceptional Children, May, pp. 619-624.

15. Brolin, D. E. 1976. Vocational Preparation of Retarded Citizens. Charles E. Merrill Publishing Company, Columbus, Ohio.
16. Campbell, D. T. and J. C. Stanley. 1963. Experimental and Quasi-Experimental Designs for Research. Rand McNally and Company, Chicago, Illinois.
17. Chandler, C. R. 1977. Babysitting for houseplants. Teaching Exceptional Children, Spring, pp. 61-63.
18. Chinn, P. C., C. J. Drew, and D. R. Logan. 1975. Mental Retardation: A Life Cycle Approach. C. V. Mosby Company, St. Louis, Missouri.
19. Cicchetti, R. 1975. Working with the handicapped. Agricultural Education 47(11):247.
20. Curtis, S. M. 1975. The mentally retarded can contribute. Agricultural Education 47(11):243-244.
21. Davitz, J., L. Davitz, and I. Lorge. 1969. Terminology and Concepts in Mental Retardation. Teachers College Press, New York, New York.
22. Delp, H. A. 1957. Criteria for vocational training of the mentally retarded, a revised concept of the necessary mental level. Training School Bulletin 54:14-20.
23. DiMichael, S. G. 1967. Are jobs for the retarded increasing? Mental Retardation 5:40-41.
24. Durbin, L. 1973. New horizons for the mentally handicapped. Children Today 2(1):64-65.
25. English, R. W. and P. L. Browning. 1974. Pre-vocational considerations in rehabilitating the mentally retarded. In Browning, P. L. 1974. Mental Retardation - Rehabilitation and Counseling. Charles C. Thomas, Springfield, Illinois.
26. Eskridge, C. S. and D. L. Partridge. 1963. Vocational rehabilitation for exceptional children through special education. Exceptional Children 29:452-458.
27. Fenton, J. and M. M. Thompson. 1967. The process of organizing a program for the employment of the mentally retarded in a state civil service system. Rehabilitation Literature 28:2-9.

28. Gold, M. W. 1973. Research on the vocational rehabilitation of the retarded: the present, the future. In Ellis, N. R. 1973. International Review of Research in Mental Retardation. Vol. 6, Academic Press, New York.
29. Guspie, J. A. 1973. How flowers help the handicapped. Florist 7:42-43.
30. Hartman, H. and D. Kester. 1968. Plant Propagation - Principles and Practices. Prentice Hall, Englewood Cliffs, New Jersey.
31. Hefley, P. D. 1972. An Investigation of Horticulture as a Technique for the Rehabilitation of the Older Institutionalized Mentally Retarded Individual. M.S. Thesis, University of Maryland, College Park, Maryland.
32. _____. 1973. Horticulture: a therapeutic tool. Journal of Rehabilitation 39(1):27-29.
33. Heriteau, J. 1975. East Gardening Projects. Popular Library, New York.
34. Hiott, J. 1975. A Hortitherapy Program for the Mentally Handicapped. Research Series No. 157. Horticulture Department, The South Carolina Agricultural Experiment Station, Clemson University, Clemson, South Carolina.
35. Hutt, M. L. and R. G. Gibby. 1965. The Mentally Retarded Child - Development, Education, and Treatment. Allyn and Bacon, Inc., Boston, Massachusetts.
36. Johnston, E. R. 1899. The value of sense training in nature study. Journal of Psycho-Aesthenics 4(3):213-217.
37. Jordan, T. and R. DeCharms. 1959. The achievement motive in normal and retarded children. American Journal of Mental Deficiency 64:457-466.
38. Kilby, L. P. Horticulture and horticultural therapy at the Charles Lea Center. Spartansburg, South Carolina, (Unpublished).
39. Lawrence, G. M. 1900. Principles of education for the feeble minded. Journal of Psycho-Aesthenics 4(3):100-108.
40. Lewis, C. A. 1974. People-plant interaction. Talk presented at Hortitherapy workshop. Clemson University, Clemson, South Carolina, (Mimeo).

41. Lewis, C. A. 1976. Human perspectives in horticulture. Symposium Proceedings. Northeastern Forest Experiment Station, Upper Darby, Pennsylvania, (Unpublished).
42. _____. 1976. People-plant interaction: human perspectives in horticulture. HortScience 11(1):4-5.
43. _____. 1976. The evolution of horticultural therapy in the United States. National Council for Therapy and Rehabilitation through Horticulture Newsletter 2(5).
44. Mallas, A. 1974. Mallas weighs outlook for employment of retarded. PCMR Message 36:11.
45. McDonald, H. and G. Bronson. 1969. Special education includes instruction in ornamental horticulture. Agricultural Education 42(4):90.
46. Melwood Horticultural Training Center. 1973. Horticulture: An Exceptional Training Medium for Mentally Retarded Females. Final Report. Demonstration Grant No. RD-12-p-55109/3-03, Upper Marlboro, Maryland.
47. Mescheter, J. 1975. How to Grow Herbs and Salad Greens Indoors. Popular Library, New York.
48. Nayowith, M. 1970. A proposal for training educable mentally retarded adolescents and adults for roles as physical education, recreation aides and associates. American Corrective Therapy Journal 24(4):115-117.
49. Neman, R. S. and R. E. Luckey. 1976. Number and percent of mentally retarded students in public school classes. Education and Training of the Mentally Retarded. April, pp. 158-159.
50. Parker, S. L. 1975. Improving Occupational Programs for the Handicapped. Published by the U. S. Department of Health, Education, and Welfare, Washington, D. C.
51. Patrick, D. 1960. Retardates in a work adjustment program. American Journal of Occupational Therapy 14:297-300.
52. Peck, J. R. 1958. The Marbridge plan: a Texas experiment in habilitation for mentally retarded youth. Exceptional Children 24:346-350.

53. Peterson, R. O. and E. M. Jones. 1964. Guide to Jobs for the Mentally Retarded. American Institutes for Research, Pittsburg, Pennsylvania.
54. Phipps, L. J. 1972. Handbook on Agricultural Education in Public Schools. The Interstate Printers and Publishers, Inc., Danville, Illinois.
55. President's Committee on Mental Retardation. 1969. These Two Must be Equal: America's Needs in Habilitation and Employment of the Mentally Retarded. U. S. Government Printing Office, Washington, D. C.
56. Relf, P. D. 1976. Horticulture in a Semi-self Supporting Training Center for Mentally Retarded Adults. Ph.D. Dissertation, University of Maryland, College Park, Maryland.
57. Rosenblum, S., C. Przybyl, and P. Brioniconto. 1959. A survey of farm and dairy operations in institutions for the mentally retarded. American Journal of Mental Deficiency 64:87-91.
58. Schelby, F. A. 1972. Exploring Careers in Horticulture for Multiply Handicapped Children. State grant proposal by Merced County Department of Education, Merced, California.
59. Sigler, G. R. and C. J. Kokaska. 1971. A job placement procedure for the mentally retarded. Education and Training of the Mentally Retarded. December, pp. 161-166.
60. Strickland, C. G. 1974. Job training placement for retarded youth. In Daniels, L. K. 1974. Vocational Rehabilitation of the Mentally Retarded. Charles C. Thomas, Springfield, Illinois.
61. U. S. Department of Health, Education, and Welfare. 1972. Selected Career Education Programs for the Handicapped. Bureau of Education for the Handicapped, Washington, D. C.
62. Wakefield, R. 1962. Work experience for the mentally retarded in Santa Monica. National Association of Secondary-Schools Principals Bulletin 46:217-219.
63. Wallin, J. E. 1955. Education of the Mentally Handicapped Children. Harper and Brothers, New York, New York.
64. Watson, D. P. and A. W. Burlingame. 1960. Therapy through Horticulture. The MacMillan Company, New York, New York.

65. White, B. and H. Redkey. 1956. The Pre-Vocational Unit in a Rehabilitation Center. U. S. Department of Health, Education, and Welfare, Office of Vocational Rehabilitation, Washington, D.C.
66. Wochler, W. 1975. Teaching the disadvantaged and handicapped. Agricultural Education 47(11):245-246.

APPENDIX 1

PREVOCATIONAL ORNAMENTAL HORTICULTURE FOR THE E.M.R. STUDENT

INSTRUCTIONAL UNIT

I. Topic Areas to be implemented in the following order:

1. Sprouting Mung Beans
2. Growing Nasturtiums
3. Gardening with Zinnias
4. Making Coleus Cuttings
5. Growing Cress for Salads

II. Situation:

1. Students are classified as E.M.R., and are enrolled in a special education program.
2. Instruction of this unit will be carried out by the special education teacher who has no prior knowledge of, or experience in, horticulture.
3. The lesson plans can be implemented in a regular classroom setting. No laboratory or greenhouse facilities or windows are needed.
4. The students will eventually enter a regular vocational program.

III. General Objectives:

1. To acquire a general knowledge of horticulture before entering a regular vocational program.
2. To improve mental skills.
3. To learn appropriate social interaction.
4. To acquire good work habits and attitudes.

III. General Objectives Continued:

5. To increase responsibility.
6. To enhance awareness of surroundings and self.
7. To improve self-confidence.

APPENDIX 1a

I. Program Title: Prevocational Ornamental Horticulture for the
E.M.R. Student

II. Unit: Indoor Gardening in the Classroom

III. Topic: Sprouting Mung Beans

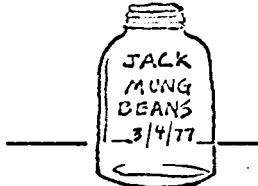
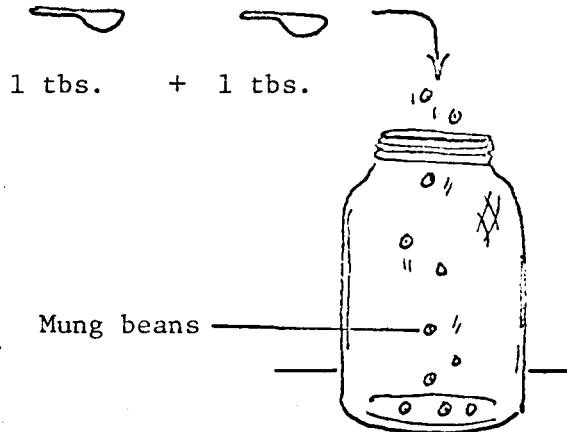
IV. Skills Involved in Completing Performance Objectives:

1. Gross motor coordination
2. Fine motor coordination
3. Simple judgement
4. Complex judgement
5. Visual perception
6. Sensory perception
7. Social interaction
8. Mathematics
9. Memory
10. Verbalization
11. Writing

V. Teaching Outline

The teacher should complete the projects along with the
students.

V. Teaching Outline

Performance Objectives	Materials	Information
<p>#1 The student will be able to verbally identify the following items when shown: Mung beans; cheesecloth; ruler; grease pencil; table-spoon.</p>	<p>Mung beans; rubber bands; rulers, cheese-cloth; table-spoons; grease pencils; plas-tic wrap; wide-mouth quart jars; black markers; scissors; measuring cups</p>	<p>1. Assemble the corresponding materi-als and make a game out of iden-tifying them correctly.</p>
<p>#2 The student will be able to cor-rectly label the front of his jar with his name, Mung bean, and date.</p>	<p>jars; grease pencils</p>	<p>2. Have each student label his jar with his name, Mung beans, and the date using a black grease pencil.</p> 
<p>#3 The student will be able to meas-ure two level tablespoons of Mung beans, and pour them into the jar.</p>	<p>Mung beans; tablespoons</p>	<p>3. The student should measure two tablespoons of Mung beans, and pour them into his jar.</p> 

#4

The student will be able to correctly measure and cut out a 6" square of double-thickness cheesecloth.

scissors;
markers;
rulers

#5

The student will be able to correctly center a square of cheesecloth over the mouth of the jar.

cheesecloth

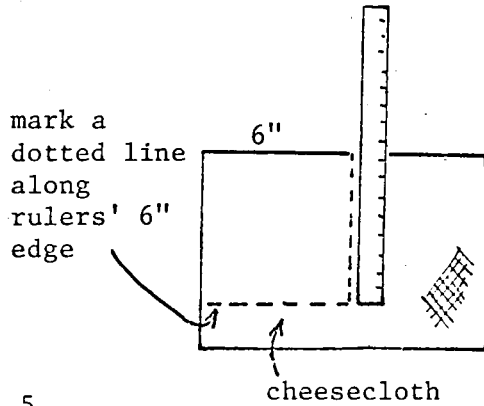
#6

The student, working with a partner, will be able to secure the cheesecloth over the mouth of the jar with a rubber band.

rubber bands

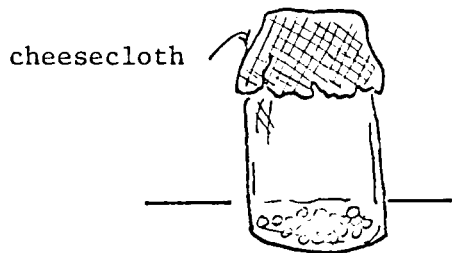
4.

Have each student measure and mark off a 6" square of double-thickness cheesecloth using a ruler and a black marker.



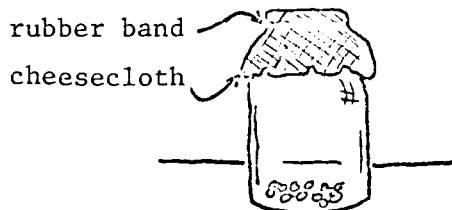
5.

Each student should take the cheesecloth square and center it over the jar mouth.



6.

Now the students need to start working in pairs. One should hold the cheesecloth down while the other places a rubber band around the jar mouth...and vice-versa.



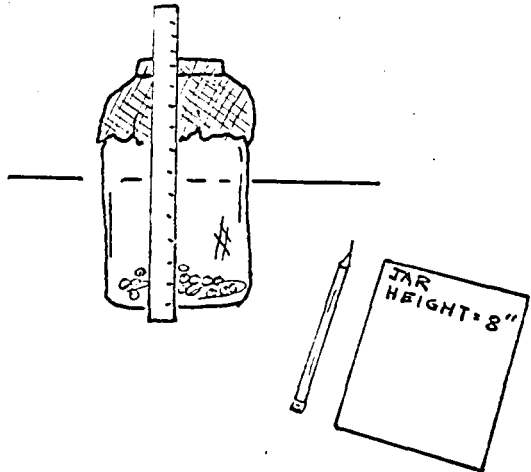
#7

The student will be able to accurately determine the total height of his jar, and record it on a piece of paper.

rulers;
pencils;
paper

7.

Using a ruler, each student should determine the total height of his jar and record it on a piece of paper.



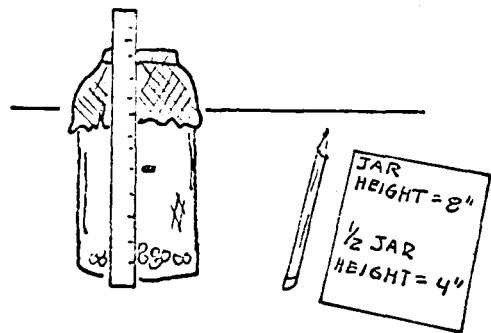
#8

The student will be able to correctly determine what 1/2 the height of his jar is equal to, and record it on a piece of paper.

rulers;
pencils;
paper;
grease
pencils

8.

Now each student should determine what 1/2 the height of their jar is equal to and should mark it on the jar using a grease pencil. Record this height on the piece of paper.



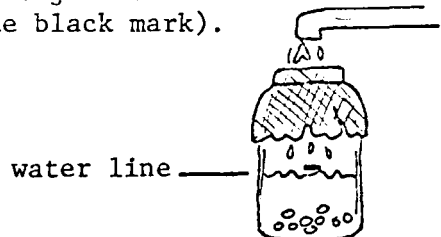
#9

The student will be able to correctly determine when the jar is half-full of water.

water

9.

Fill the jar half-full of water (to the black mark).



#10

The student will be able to verbally state why the Mung beans are left to soak overnight.

magnifying
glass

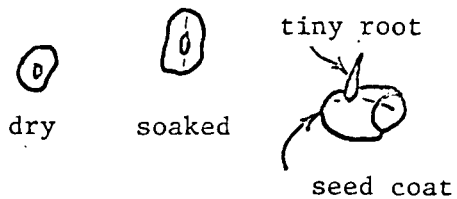
#11

The student will be able to correctly drain the Mung beans.

10.

The students should place their jars in a warm (60-80°F); dark place like a closet. Let the beans soak there overnight.

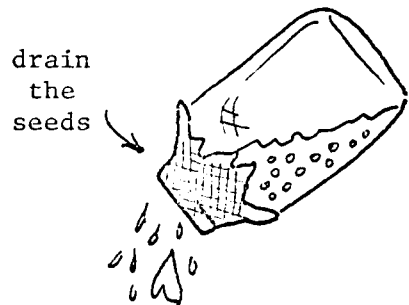
The beans need to be soaked overnight so that their hard seed coat (the outermost "shell" of the seed) will soften, enabling the root and shoot to emerge. After soaking, the beans get soft and double in size due to the amount of water they have absorbed. Some may even have a tiny root showing, indicating that it has begun to sprout.



The Mung bean is olive green in color and quite big. You can see the growth better if you use a magnifying glass.

11.

The next day the students should remove their jars from the closet and pour the water out, draining the seeds well.



#12

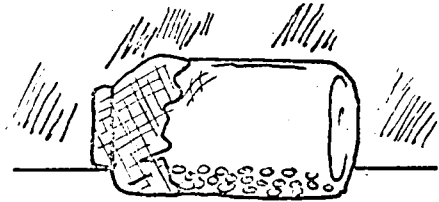
The student will be able to place his jar on its side so that the beans are evenly spread out.

#13

The student will punctually rinse the beans and drain them three times a day.

12.

Now place the jars on their sides so that the beans are evenly spread out. Leave them like this in a dark place.



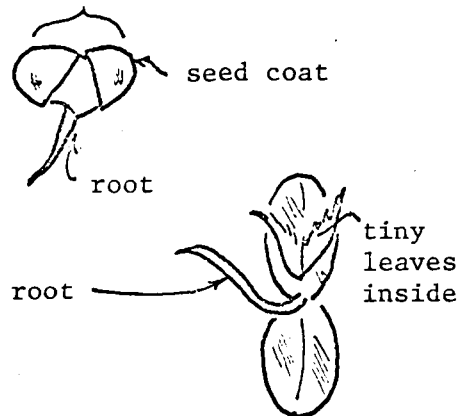
13.

Take the seeds out of the closet to rinse and drain them 2-3 times a day for the 3-4 days that you grow the sprouts. Place the jars back on their sides in the closet after each rinsing.

Examine the sprouts each day to observe their growth. Remove one of the beans everyday. Take it apart and examine it. Taste one each day to see which day the flavor is best.

By day #2 root should be longer and the seed coat will be falling off. Tiny leaves should be visible inside.

food storage area



#14

The student will be able to draw and color a simple diagram of a Mung bean.

paper;
pencils;
crayons or
pastels

#15

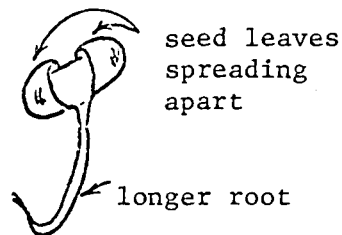
The student will be able to successfully remove the cheesecloth and rubber band from the jar mouth.

paper towels
or some other
container to
hold bean
sprouts

14.

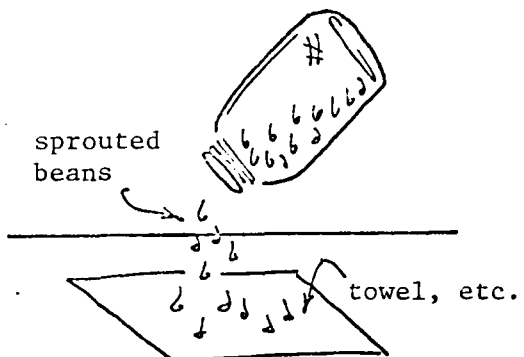
By day #3 the seed leaves (two halves of the bean) are spreading apart. The bean (beans are seeds) is a tiny storehouse of food for the new plant. The food in the bean is what enables the plant to grow.

Have each student draw and color a diagram of his bean at this stage.



15.

On the third day the students should remove the rubber band and cheesecloth from the jar mouth. They should then pour out the sprouted beans onto a paper towel or in some other container.



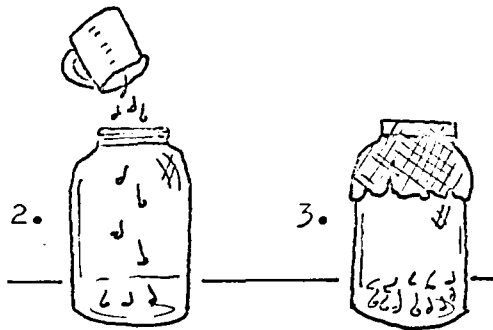
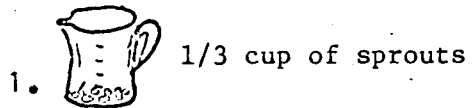
#16

The student will be able to accurately measure 1/3 cup of Mung beans.

measuring cups

16.

Put some of these sprouts back into a measuring cup until it is 1/3 full. Then pour the 1/3 cup of beans back into the jar. Cover the jar with the cheesecloth, securing it with a rubber band.



Continue the rinsing and draining procedure. Observe the growth.

#17

The student will be able to verbally state why Mung beans are nutritious.

17.

Sprouts are very nutritious as they contain many nutrients - protein, vitamins, and minerals. Many people, such as the Chinese, and Japanese, make them a regular part of their diet. More and more health conscious Americans today are enjoying the taste and value of sprouts, too.

#18

The student will be able to verbally list five other seeds that are good for sprouting.

#19

The student will be able to verbally name three ways to prepare Mung bean sprouts to eat.

18.

Here are a few other seeds you can sprout:

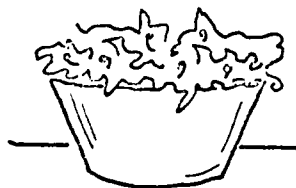
Alfalfa	Flax	Rye
Barley	Lentil	Sesame
Buckwheat	Oat	Sunflower
Chick pea	Peas	Soybean
Corn	Pumpkin	Beans

The teacher may want to purchase some of the above seeds to let the students try. Most can be purchased at any health food store. Be sure to get the unhulled sesame seeds.

BEWARE. Don't eat just any seed as many are poisonous. Stick to the recommended ones.

19.

Let the students take home their sprouts and eat them raw in their salad tonight...



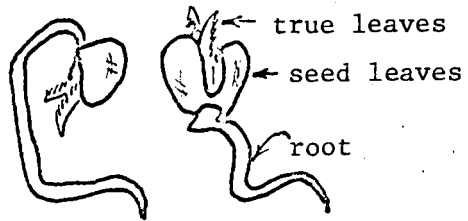
sprouts
in
salad

Or cook them for three minutes and serve them as a hot vegetable.

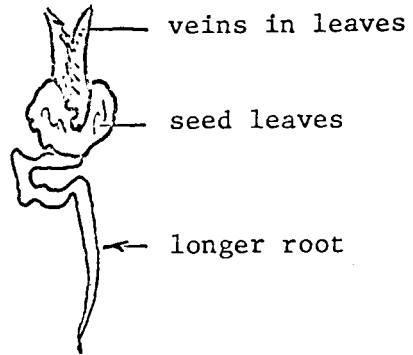
Sunflower sprouts can be cooked for three minutes then combined with milk in a blender and sweetened with honey and vanilla for an unusual treat.

Or try mixing the sprouts with mayonnaise and lemon juice and spread them on bread for a nutritious lunch.

By the fourth day the roots are quite long and the tiny "true leaves" are starting to show above the seed leaves.

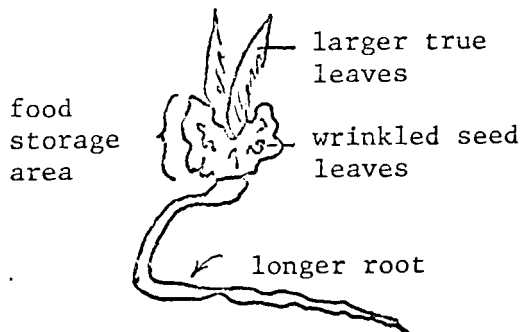


If you open the bean, you will see that the leaves have tiny veins in them.



Taste the sprouts. Have they gotten bitter?

By day #5 the leaves are bigger still and some of the seed leaves are beginning to wrinkle.



#20

The student will be able to correctly identify the parts of a Mung bean sprout.

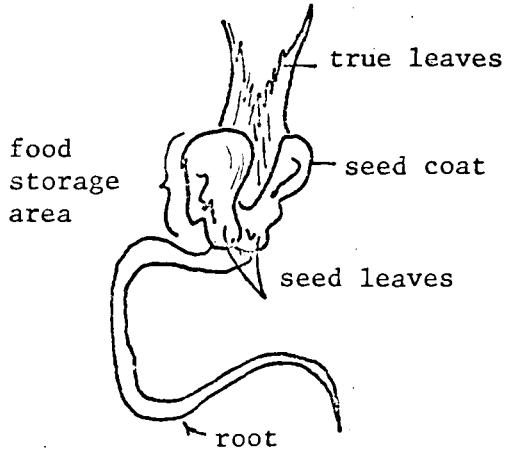
diagrams of sprouts;
crayons or pastels

#21

The student will be able to count out five bean sprouts.

20.

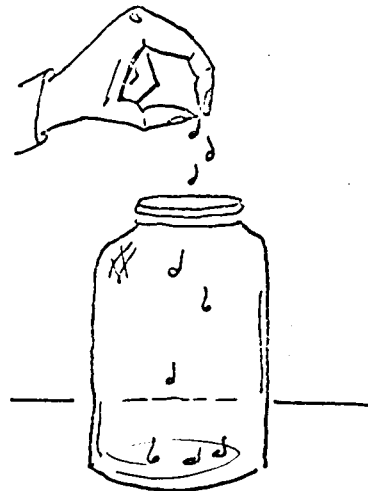
Examine a sprout. Have the students identify the parts of the sprouted Mung bean. The teacher should draw a large diagram of the bean on the board with the parts labeled as follows:



Distribute diagrams of the sprout. Have the students label and color the parts.

21.

Discard all but five of the sprouts. Each student should drop five back into the jar.



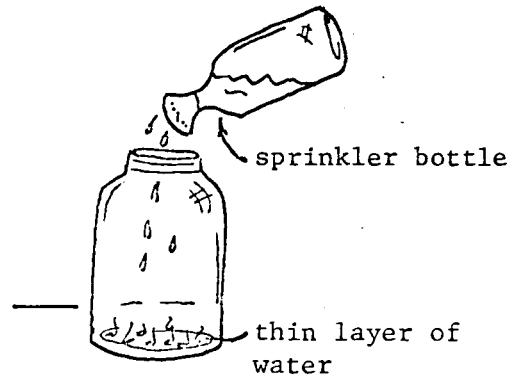
#22

The student will be able to correctly use a sprinkler bottle.

sprinkler bottle

22.

Pour a little water into the bottom of the jar using the sprinkler bottle. Just enough water to cover the bottom with a thin layer is needed.



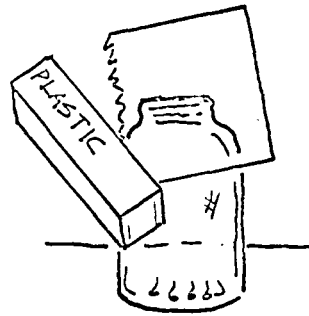
#23

The student will be able to correctly tear off a piece of plastic wrap from a roll.

plastic wrap

23.

Have each student tear off a piece of plastic wrap from the roll large enough to cover the mouth of their jars.



#24

The student will, working with another student, be able to cover the jar mouth with the plastic wrap, securing it with a rubber band.

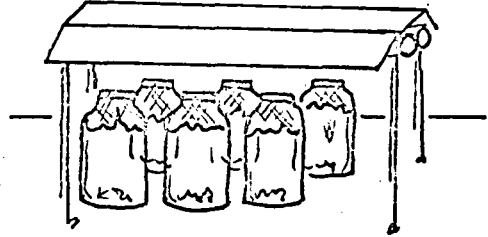
rubber bands

24.

Working in pairs, the students should help each other cover the mouths of their jars using the plastic and a rubber band.

Gro-lite

Place the jars (right side up) under the Gro-lite or on a sunny windowsill.



#25

The student will be able to verbally state why the Mung bean sprouts need light to continue to grow.

25.

Leave the sprouts here for 2-3 days, then let the students remove them and examine them. Don't let the sprouts dry out. By the 7th or 8th day the plant should have big leaves and a lot of roots. The Mung bean will be all shrunken and wrinkled. It has given all of its food to the new plant and is now drying up. The plant's green leaves shows that it now has chlorophyll and that it can make its own food through a process known as photosynthesis. If the plant did not have the sun and its energy, it wouldn't be able to make its own food. Plants need sunlight (or the similar rays of a Gro-lite) to live.

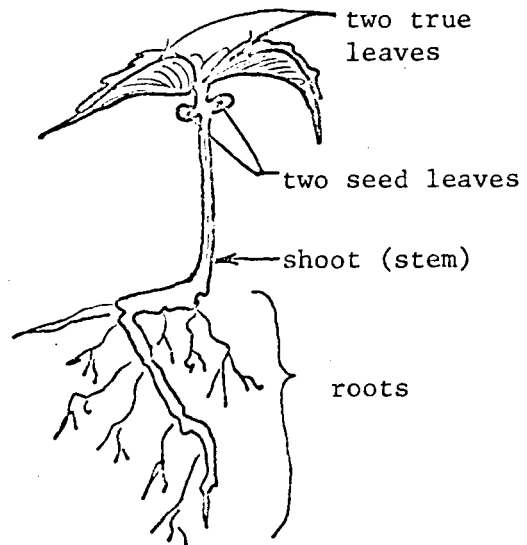
#26

The student will be able to correctly identify the parts of a Mung bean seedling.

26.

Let the students identify the parts of their Mung bean plant. Draw a diagram on the board or on a worksheet corresponding to the one below.

This small bean plant is called a "seedling" now instead of just a sprout.



This seedling will not taste very good at this stage.

VI. Related Events and Activities:

1. Have the students set up growth charts to record growth and progress of their Mung beans.
2. Demonstrate how to cook sprouts in a wok.
3. Try making some different recipes using the sprouts.
4. Set up comparative growth studies between beans sprouting in jars vs. beans sprouting in wet paper towels vs. beans sprouting in Jiffy-Mix.
5. Collect seed catalogues to make collages.
6. Have students complete work sheets as a review of the topic area.

VII. References and Teaching Aids:

1. Anonymous. Sprout. Berkshire Garden Center; Stockbridge, Massachusetts. (pamphlet)
2. Anonymous. 1974. A Child's Garden. Ortho Chemical Co., San Francisco, California.
3. Hartman, H. and D. Kester. 1968. Plant Propagation - Principles and Practices. Prentice-Hall, Inc.; Englewood Cliffs, New Jersey.
4. Mescheter, J. 1975. How to Grow Herbs and Salad Greens Indoors. Popular Library; New York.

APPENDIX 1b

I. Program Title: Prevocational Ornamental Horticulture for the
E.M.R. Student

II. Unit: Indoor Gardening in the Classroom

III. Topic: Growing Nasturtiums

IV. Skills Involved in Completing Performance Objectives:

1. Gross motor coordination
2. Fine motor coordination
3. Simple judgement
4. Complex judgement
5. Verbalization
6. Mathematics
7. Writing
8. Visual perception
9. Sensory perception
10. Memory
11. Reading

V. Teaching Outline

The teacher should complete the projects along with the students.

V. Teaching Outline

Performance Objectives	Materials	Information
<p>Motivational activity.</p> <p>#1 The student will be able to identify the following materials: plastic pot; label; potting soil; shards; sprinkler bottle.</p> <p>#2 The student will be able to verbally state two uses for Nasturtiums.</p>	<p>Word Search games</p> <p>plastic or aluminum tray; 4" plastic pots; shards; potting soil; labels; clay pot; hammers; sprinkler bottle; Nasturtium seed; rulers</p> <p>flower or seed catalogues</p>	<p>Hand out the Word Search games. Have students find and circle the following vocabulary words pertaining to this unit: Nasturtium; label; shards; germination; seedling.</p> <p>1. Assemble the corresponding materials, making sure the students can identify them correctly. **Note: the potting soil consists of: 4 parts builders sand, 1 part soil, 1 part peat moss, 1 part horticultural grade vermiculite. **Note: vermiculite is mica that has been expanded by heating it to very high temperatures in a furnace. **Note: shards are broken clay chips or pieces.</p> <p>2. Discuss the following information with the students concerning Nasturtiums. Try to obtain flower catalogues, etc. so that they can look at pictures of actual Nasturtiums.</p> <p>The Nasturtium (its generic name is <u>Tropaeolum</u>) grown today has been developed from a wild flower growing in the mountains of Central and South America. It was originally introduced into Europe as a food plant. In England it was first known as Indian Cress. Its tender young leaves and brilliant flowers have a sharp, peppery taste, and were served in salads. The green seed pods that</p>

#3

The student will be able to determine the kind of plant he will be growing by reading the seed packet.

Nasturtium seed packets.

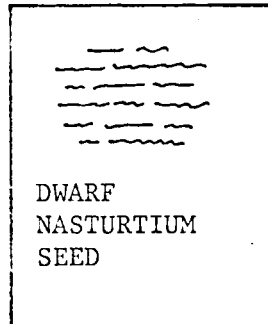
#4

The student will be able to verbally explain what an annual is.

develop when the blossoms are gone are also edible and were often pickled and preserved for later use. Because of its showy flowers, plant breeders developed it as a flowering plant, and it was common in our grandparents' gardens. Today it is grown mostly for its blooms, but some people still use its leaves as a salad green, and its flowers and pods for food purposes.

3.

Have the students read the information on the seed packet. Let them determine what kind of plant they will be growing. Discuss other information on the packet regarding how and when to plant outdoors, color of flowers, etc.



4.

The type of Nasturtium the students are growing is an annual. An annual means that the plant lives for only one growing season or year, and then dies. There are many different kinds of Nasturtiums, trailing, climbing, etc.

Find out and discuss what a perennial is; a biennial.

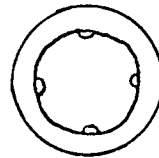
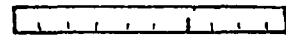
#5

The student will be able to correctly measure and determine what size pot he has.

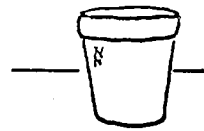
4" pots;
rulers

5.

The students should select one 4" pot from the stack. The pot size is usually specified on the bottom of the pot. If not, measuring the diameter at the rim will give you its correct size. Have the students measure their pots to determine what size they are.



or



pot bottom

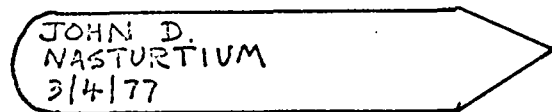
#6

The student will be able to write his name, plant, and date correctly on a label.

labels; pencils

6.

Each student should obtain one plastic (or wooden) label. Make sure each person has a pencil. Ink runs on plastic and wooden labels, so avoid using it. Label as indicated.



If the students have trouble with labeling, have them cut out paper labels and practice labeling these.

#7

The student will be able to verbally explain what shards are.

Gro-lite;
tray; potting
soil; shards

#8

The student will be able to make shards.

clay pot;
hammers

7.

Let one or two of the students assemble the tray under the Gro-lite. (Aluminum roasting pans work well as a tray.)

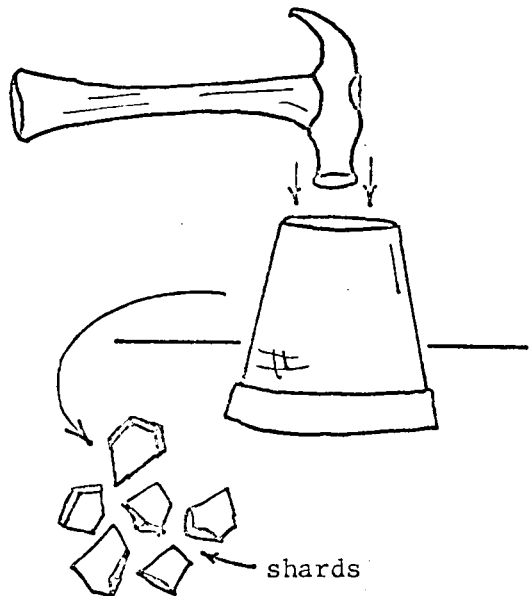
Place the potting soil and shards in a location accessible to everyone.

**Remember, shards are broken clay chips or pieces.

8.

Let the students try making their own shards. Obtain a clean clay flower pot (or piece of a broken one). Break the pot into small pieces using a hammer.

**Warning: Exercise caution when hammering the pot. Flying shards could harm someone.



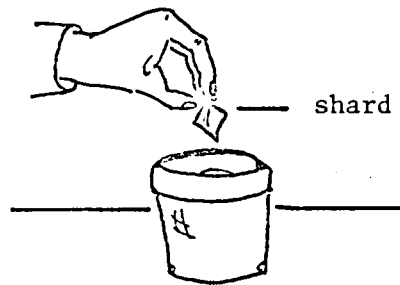
#9

The student will be able to count out eight shards and state what they are used for.

shards

9.

Each student should count out 8 shards for himself, and place them in the bottom of his pot. Shards allow water to drain out of the pot better. Plant roots don't normally like to stand in water.



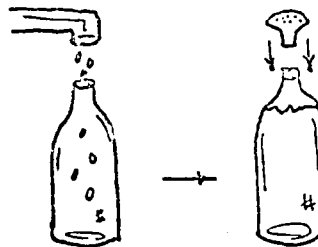
#10

The student will be able to correctly fill and assemble a sprinkler bottle.

sprinkler bottle; spray head

10.

Have one student fill the sprinkler bottle, and put the spray head on. Make sure all the students can do this.



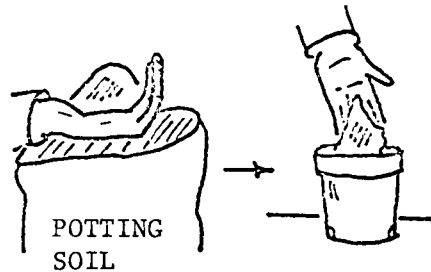
#11

The student will be able to correctly fill his pot with potting soil.

potting soil

11.

Each student should fill his pot with potting soil as shown. Do not pack the soil down. If you do, the plant's roots will not have enough air in the soil, and water will not flow through the soil freely enough to ensure good drainage.



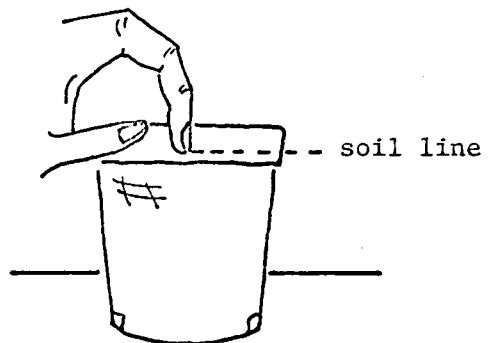
#12

The student will be able to accurately determine how high to fill the pot with soil.

marked label

12.

A fingernail's length of space should be left between the pot rim and the top soil line. This is done so that there will be space left to hold water when watering the pot. If students have difficulty determining how high to fill the pot with soil, use a marked label.



#13

The student will be able to count out three seeds.

seeds

13.

Each student should pour out three seeds for himself from the packet.

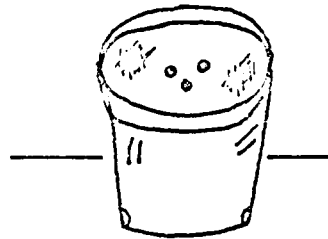


#14

The student will be able to correctly place his seeds in the pot.

14.

Place the seeds near the center of the pot, but not touching each other.

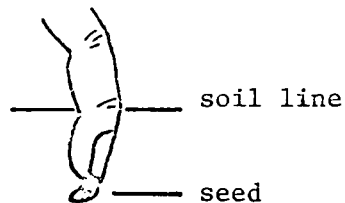


#15

The student will be able to determine how deep to plant his seeds.

15.

With the index finger, gently push each seed into the soil to the depth of about one inch.



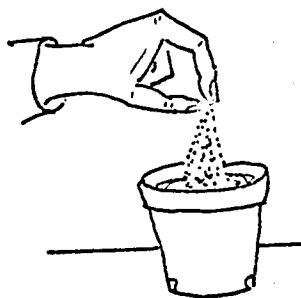
#16

The student will be able to cover the seeds with the correct amount of soil.

potting soil

16.

Cover the seeds with approximately one tablespoon of potting soil (just enough to fill up the holes made by pushing the seeds in).



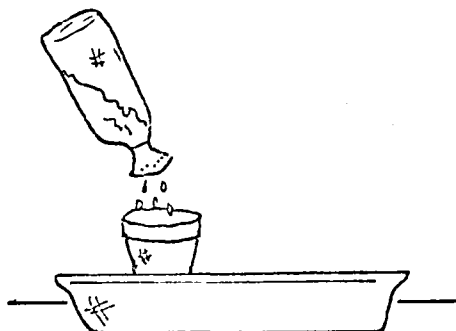
#17

The student will be able to determine when the soil is completely saturated with water.

sprinkler bottle

17.

Set the pots in the tray under the Gro-lite. Carefully water the soil with a fine spray from the sprinkler bottle (this prevents the seeds from washing down). Water thoroughly until all the soil is completely saturated. If water collects in the tray (and it should, if you've watered correctly), remove the pots and pour the excess water out of the tray.



#18

The student will be able to verbally state why the Nasturtiums should not stand in drain water.

#19

The student will be able to correctly stick his label in his pot.

labels

#20

The student will be able to correctly set a timer.

Gro-lite timer

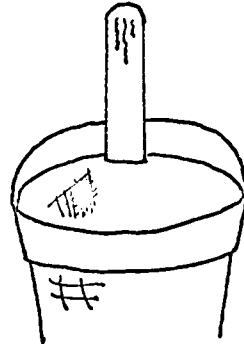
18.

It's not good to let potted plants stand in drain water because most plants don't like their roots kept constantly wet. Standing in drain water encourages root rotting and disease.

After disposing of the excess water in the tray, return the pots to the tray under the Gro-lite.

19.

Each student should stick his label in his pot as indicated.



20.

Set the Gro-lite timer for 14 hours of light daily. If a Gro-lite is not used, set the pots on a sunny windowsill. It may be necessary to let the students practice setting the timer.

#21

The student will be able to verbally state why the seeds need to be kept moist.

21.

The seeds need to be kept moist in order to germinate or sprout. Absorption (or uptake of water) is the first stage in the process of germination.

Keep the soil moist, but not wet. Water once or twice weekly with the sprinkler bottle until the seedlings sprout. Remember to keep the excess water out of the tray.



If a mildew-like growth appears on the soil, allow the soil surface to dry out. Mildew is a sign that the soil is being kept too wet, and that proper air circulation is lacking. The seeds should germinate in ten days.

DAYS TO GERMINATE

	①	②	③	④	⑤	⑥
⑦	⑧	⑨	⑩	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

#22

The student will be able to determine when it is time to thin-out the Nasturtiums.

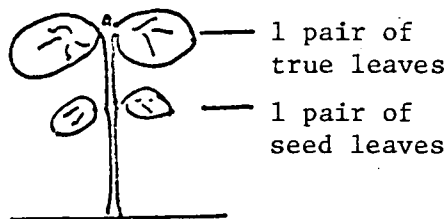
#23

The student will be able to correctly thin-out the seedlings.

pots or
half-pint
milk cartons;
soil; shards;
labels

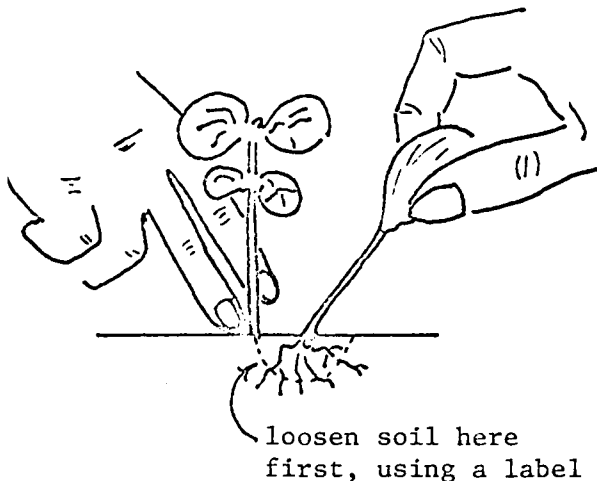
22.

When the seedlings have developed two pairs of leaves (one pair of "true leaves" and one pair of "seed leaves"), it is time to thin-out.



23.

Gently pull out the spindliest seedlings, leaving only the strongest one. Be careful not to injure their delicate stems and roots. And always handle them by their "seed leaves" as shown.



The seedlings removed can be potted in additional pots or in half-pint milk cartons with holes punched in the bottom, and shards added. Plant the seedling the same depth as it was originally growing. Always handle by the "seed leaves", not the stem.

#24

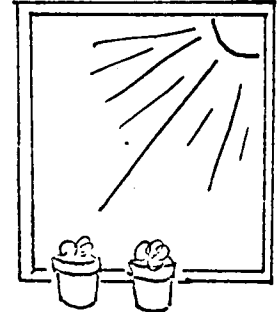
The student will be able to verbally explain why plants in a window need turning 1/4 turning each day.

24.

If your classroom has sunny windows (southern exposure), you can now set the pots on the sill. Turn them a quarter turn daily so that the stems will grow straight.



turn pot
1/4 turn
daily



If you don't have a sunny window, place the pots under the Gro-lite, and set the timer for 14 hours of light daily. Nasturtiums won't bloom unless there is a lot of light. Also, the stems will be tall and spindly unless adequate light is provided.

#25

The students will be able to determine by visually inspecting the plant, and by handling the pot, when the Nasturtium needs watering.

25.

Water the pots weekly. This may have to be adjusted, depending on whether your classroom is exceptionally dry or humid, or hot or cool. When the pot feels light to pick up, and the soil is fairly dry when you stick your finger into the soil, it is time to water.



pot feels
light



soil feels
dry

#26

The student will be able to display correct procedures for watering the Nasturtium.

#27

The student will be able to verbally state what to do if the plants show signs of insect attack.

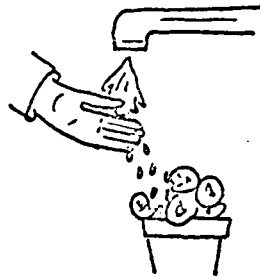
Nasturtiums like a dry, relatively infertile (not many nutrients) soil.

**Please don't make a habit of letting the leaves droop before you water the plant. Drooping leaves indicates that the plant is under stress, and stress is harmful.

26.

When watering, it is best to thoroughly soak the pots of soil, discarding any drainage water. Don't give the plants frequent light waterings. This rule of watering applies to any plant.

At this stage of plant growth, the sprinkler bottle may not be needed. Do break the hard stream of water from the faucet with your fingers, though.



27.

If your plant shows signs of insect attack, spray the leaves with lukewarm water to rid the plant of the pests. If the problem persists, consult your local garden supply dealer, and let him recommend an insecticide (chemical that kills insects).

**If it's necessary to use an insecticide on your plant, don't eat the plant.

#28

The student will be able to name two ways that Nasturtiums can be used for eating.

28.

Pick the leaves of your Nasturtiums as desired for a peppery flair in salads.



Have each student taste a leaf and describe its flavor.

Use the flowers, as they bloom, in salads or in cream cheese spreads. The flowers should bloom 5-6 weeks after planting the seeds if they have had the proper light conditions. Little fruits called "pods" will develop flowering. These can be eaten raw or cooked.

①	②	③	④	⑤	⑥	⑦
⑧	⑨	⑩	⑪	⑫	⑬	⑭
⑮	⑯	⑰	⑱	⑲	⑳	㉑
㉒	㉓	㉔	㉕	㉖	㉗	㉘
㉙	㉚	㉛				

①	②	③	④	⑤	⑥	⑦
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

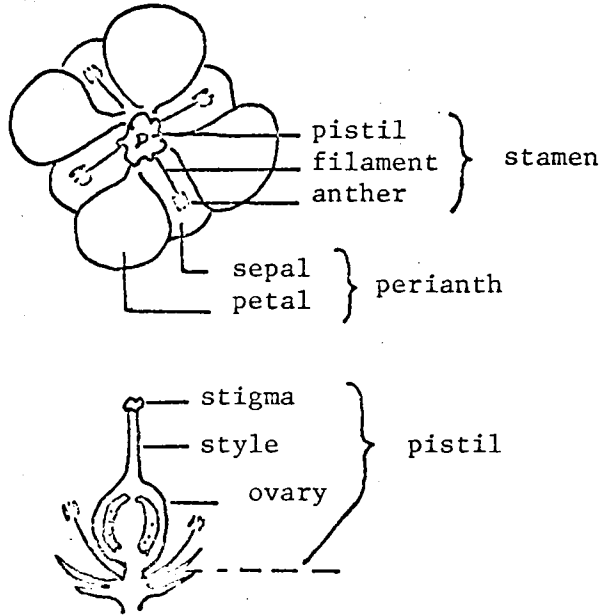
DAYS TO BLOOM FROM
PLANTING SEED

#29

The student will be able to correctly identify the parts of a Nasturtium flower.

29.

Pick a mature flower. Have the students identify the parts of the flower. Use this corresponding diagram.



construction paper;
scissors;
paper; glue

Cut out parts of the flower using colored construction paper. Have the students assemble the parts on a sheet of paper to obtain a correct flower structure.

#30

The student will be able to verbally state when and how to plant Nasturtiums outdoors.

30.

The Nasturtiums can be taken home and planted outdoors after the danger of frost. Check the last average frost date for your region. Nasturtiums are tender to frost.

Plant them in a very sunny location. They thrive in poor, infertile soil.

VI. Related Events and Activities:

1. Make a bulletin board depicting various tools, equipment, etc. used in conjunction with different areas of horticulture such as greenhouse production, landscaping, nursery production, the florist business, and truck farming.
2. Show a film related to the topic area.
3. Explore careers in horticulture. Practice filling out job applications.
4. Have students complete worksheets related to the topic area.

VII. References and Teaching Aids:

1. Anonymous. 1972. Teacher's guide for first grade plant growing project: Nasturtiums. Cleveland Public Schools' Horticulture Department; Cleveland, Ohio.
2. Ball, G., Inc. 1975. The Ball Red Book. George J. Ball, Inc.
3. Hartman, H., and D. Kester. 1968. Plant Propagation - Principles and Practices. Prentice-Hall, Inc.; Englewood Cliffs, New Jersey.
4. Heriteau, J. 1975. Easy Gardening Projects. Popular Library; New York.

APPENDIX 1c

I. Program Title: Prevocational Ornamental Horticulture for the
E.M.R. Student

II. Unit: Indoor Gardening in the Classroom

III. Topic Area: Gardening with Zinnias


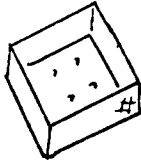

IV. Skills Involved in Completing Performance Objectives:

1. Gross motor coordination
2. Fine motor coordination
3. Simple judgement
4. Complex judgement
5. Social interaction
6. Mathematics
7. Verbalization
8. Writing
9. Visual perception
10. Sensory perception
11. Memory

V. Teaching Outline

The teacher should complete the projects along with the students.

V. Teaching Outline

Performance Objectives	Materials	Information
<p>Motivational activity.</p> <p>#1 The student will be able to identify the following materials and their uses: label; Poly-Pak tray; Jiffy-Mix; potting soil; fertilizer; compass; thermometer; Zinnia seeds.</p>	<p>drawings; paints; brushes; jars of water; pictures of Zinnias</p> <p>5"x5" Poly-Pak trays; labels; Jiffy-Mix; Thumbelina Zinnia seeds (mixed colors) 5" plastic pots; potting soil; fertilizer; compass; measuring spoons and cups; sprinkler bottle; plastic; thermometer; jars; pencils; tape; paper; stir rods; aluminum pan; Gro-lite</p> <p>Poly-Pak trays; labels; seed packets</p>	<p>Distribute mimeographed drawings of a pot of Zinnias. Obtain some tempera or watercolor paints from the art department. Show some colored pictures of Zinnias from a catalogue or book. Let the students prepare their own paints, and paint the drawing. Post the finished works on the bulletin board.</p> <p>1. Assemble the corresponding items, and make sure the students can identify them.</p> <p>Each student should obtain one of each of the following: Poly-Pak tray; label; Thumbelina Zinnia seeds (mixed colors).</p>
		  

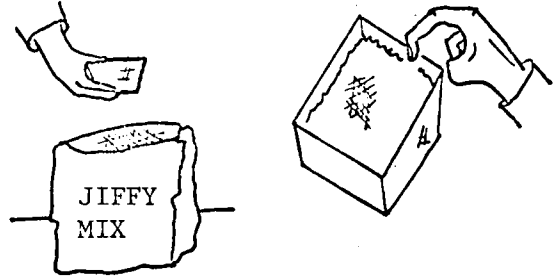
#2

The student will be able to fill the Poly-Pak tray correctly with Jiffy-Mix.

Jiffy-Mix

2.

Each student should fill his tray with Jiffy-Mix. Jiffy-Mix is the commercial name for a soilless growing medium. Fill the tray to within an index finger's nail length of the rim (about 1/2").



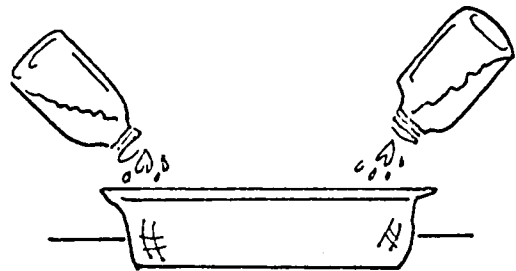
#3

The student will be able to, working with another student, fill the aluminum pan with water.

aluminum pan;
jars

3.

Let two students fill the aluminum pan (or large plastic tray) with water using two jars.

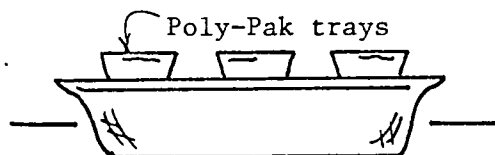


#4

The student will be able to water by the method of sub-irrigation.

4.

Place the filled Poly-Pak trays carefully in the pan of water, allowing them to float. They will soon saturate completely with water. This type of watering practice is referred to as "sub-irrigation".



#5

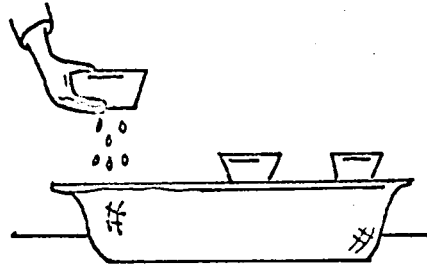
The student will be able to drain the tray of Jiffy-Mix correctly.

#6

The student will be able to, working with another student, empty the aluminum pan of water.

5.

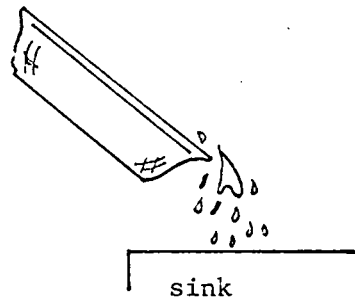
Carefully remove the Poly-Pak trays from the water when the Jiffy-Mix is completely saturated with water. Hold the trays over the pan until the excess water drains.



Place the trays of Jiffy-Mix on a water-resistant surface.

6.

Two students should now carry the pan of water to the sink and empty it.



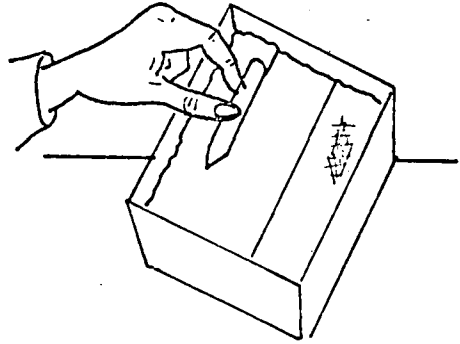
#7

The student will be able to verbally state what a furrow is, and will be able to make one correctly.

plastic labels

7.

Each student should make two straight furrows (indented rows) on top of the Jiffy-Mix. Use the label to do this. These rows should be approximately 1/4" deep.



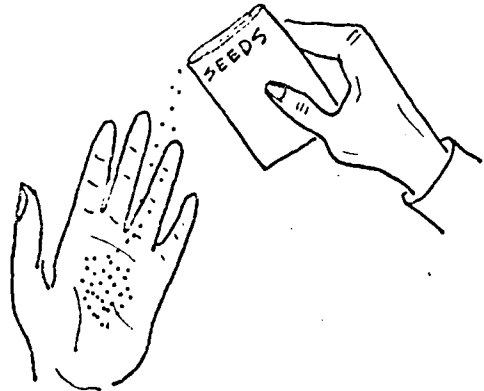
#8

The student will be able to pour the seeds correctly from the packet into his hand.

seeds

8.

Now each student should pour the seeds in his packet into the left hand.

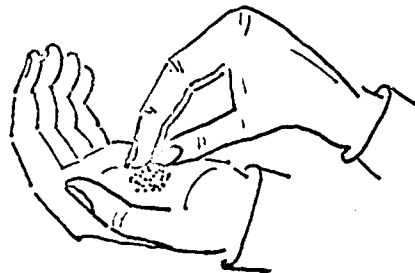


#9

The student will be able to take a pinch of seeds.

9.

Now take a pinch of seeds between the thumb and forefinger.

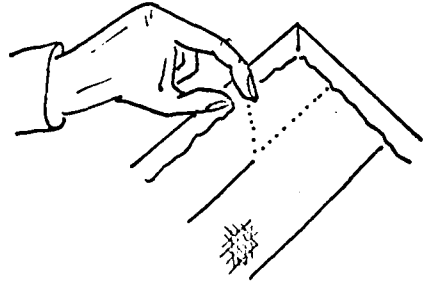


#10

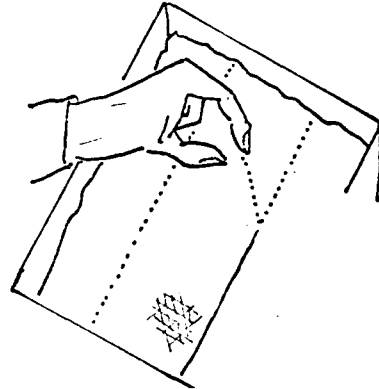
The student will be able to sow the seeds correctly.

10.

Sprinkle the pinch into one of the furrows, spacing the seeds about 1/8" apart. Continue this until 1/2 the seeds are gone. Be sure the seeds have been sprinkled in a straight line.



Now sow the other 1/2 of the seeds into the other furrow in the same way.



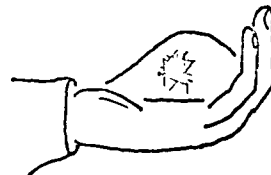
#11

The student will be able to correctly obtain a handful of Jiffy-Mix.

Jiffy-Mix

11.

Each student should get a handful of Jiffy-Mix. Be sure and scoop the soil as shown.



#12

The student will be able to correctly cover the seeds with Jiffy-Mix.

#13

The student will be able to label correctly.

labels;
pencils

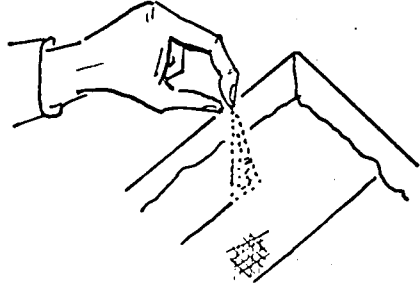
#14

The student will be able to correctly water the seeds.

sprinkler
bottle

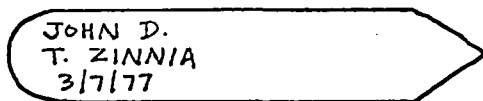
12.

Taking pinches of the Jiffy-Mix with the other hand, cover the furrows with a light cover of Jiffy-Mix. Just sprinkle enough so that the furrows are not visible anymore.



13.

Each student should write his name, T. Zinnia, and the date on the label. Use a pencil to do this. If the students have difficulty with this, cut out paper labels for them to practice on.

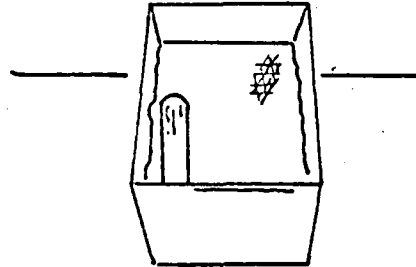


14.

Sprinkle the Jiffy-Mix and seeds lightly with water from the sprinkler bottle.

#15
The student will be able to correctly stick his label in his pot.

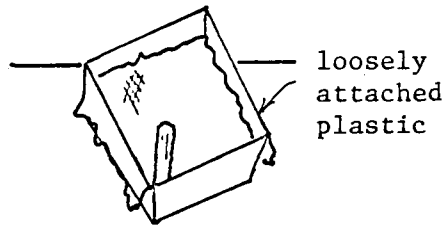
15.
Each student should stick his label in the front, left-hand corner of the Poly-Pak tray.



#16
The student will be able to correctly cover the tray with plastic.

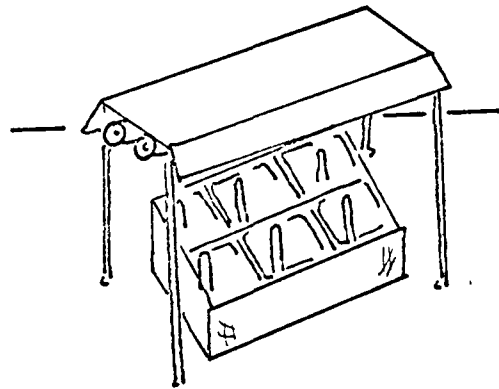
plastic wrap

16.
Cover the tray with a piece of loosely attached plastic wrap.



Gro-lite;
aluminum pan

Set the Poly-Pak trays in the aluminum pan under the Gro-lite.



#17
The student will be able to correctly set the timer.

timer

17.
Set the timer for 14 hours of light daily.

#18

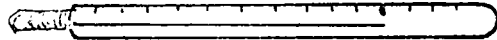
The student will be able to correctly read a thermometer.

thermometer;
strip of
paper; tape

18.

Make sure the location where the trays have been placed under the Gro-lite is free from draughts, and is relatively warm (70°F).

The teacher should obtain a thermometer and let the students read the temperature. Tape a strip of paper to the edge of the Gro-lite to determine if there are draughts.

 70°F .

#19

The student will be able to demonstrate how wet to keep the seeds.

19.

Keep the Jiffy-Mix moist at all times. Water as necessary, using the sprinkler bottle. The seeds should germinate in 7 days.

#20

The student will be able to keep written growth charts of their Zinnia production.

growth charts;
pencils or
markers

20.

Students should keep a written record or charts of the number of days their Zinnia seeds take to germinate. Growth charts of the plants entire growth cycle could be kept up on the wall.

#21

The student will be able to determine when the seeds have sprouted.

#22

The student will be able to verbally state what a seedling is.

#23

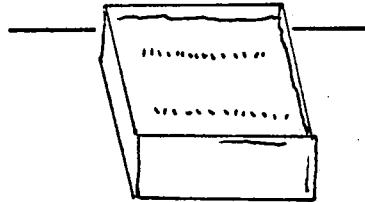
The student will be able to verbally explain what the plastic does for the seedlings, and when to remove it.

#24

The student will be able to determine when to transplant.

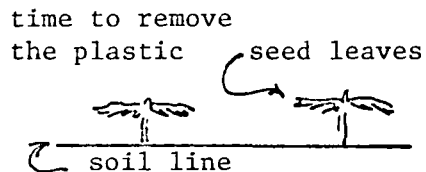
21.

The seeds have sprouted when you can see their "seed leaves" peeking above the soil line.



22.

When the seedlings (baby plant grown from seed) have germinated, and the seed leaves are clearly visible, it is time to remove the plastic.

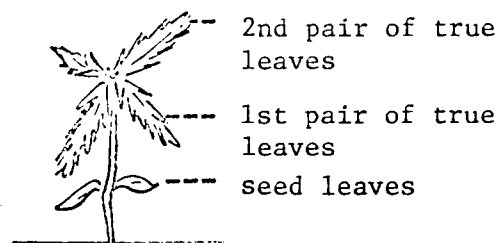


23.

Covering the seeds with plastic created a miniature greenhouse effect. The plastic caused a build-up of moisture and heat under it. This aided in the germination process.

24.

When the second pair of "true leaves" open, the seedlings are ready to transplant.



#25

The student will be able to determine and record the number of days from seedling germination to time of transplanting.

growth charts;
pencils;
markers

#26

The student will be able to fill his pot correctly with potting soil.

potting soil;
5" plastic pots

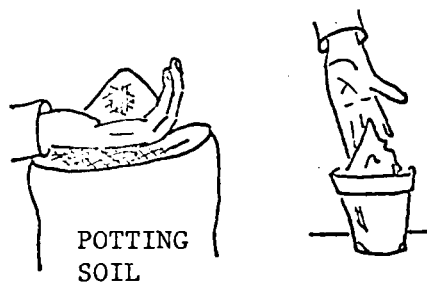
Transplant means to remove a plant from the soil it is growing in, and plant it in new soil. The seedlings need transplanting into a larger pot so that they have plenty of room to grow and flower.

25.

Each student should record the number of days from the time of seedling germination to the time of transplanting on the growth chart.

26.

Each student should now fill his 5" plastic pot with potting soil which has been moistened with water. The pot should not be filled to the rim. Leave a distance below the rim equal to that from the tip of your index finger to the first joint (about 1/2"). Do not pack the soil in the pot.



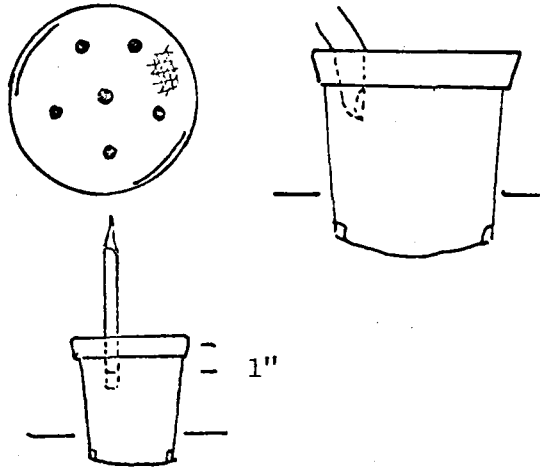
#27

The student will be able to make six holes in the soil, correctly spaced, and to the proper depth.

pencil;
marker

27.

Make 6 holes in the soil, using the index finger. Or, make a mark (using a black marker) on a pencil 1" from the eraser end. Use the pencil to make the holes.



#28

The student will be able to select the six most vigorous seedlings.

seedlings

28.

Each student should select the 6 largest and most vigorous looking seedlings to be transplanted.

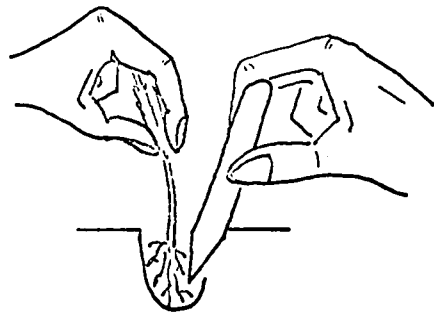
#29

The student will be able to correctly remove the seedling from the Jiffy-Mix.

labels

29.

Clasp the seedling's seed leaves between the thumb and forefinger (the leaves should be folded together as if praying). Loosen and separate the seedling from the Jiffy-Mix with a label at the same time. Never handle the seedling by its delicate stem or roots.



#30

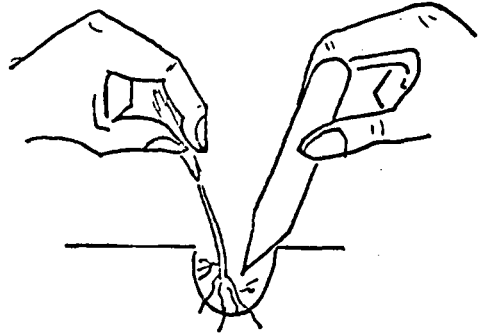
The student will be able to correctly place the seedling in the potting soil.

#31

The student will be able to correctly firm the soil around the seedling.

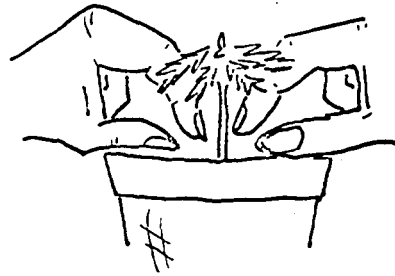
30.

Carefully pick up the seedling. Place the seedling in the middle hole, as you hold the hole open with the label. Make sure the seedling is planted no deeper than it was originally growing.



31.

Firm the soil around the seedling.



Repeat the above procedure for the other 5 seedlings.

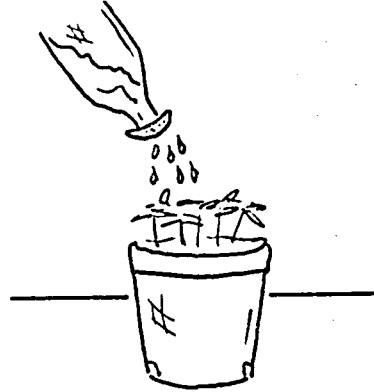
#32

The student will be able to correctly water-in the seedlings.

sprinkler bottle

32.

"Water-in" (growers' term for water) the transplanted seedlings, using the sprinkler bottle. Make sure the entire pot of soil is saturated.



#33

The student will be able to correctly set the pot of seedlings under the Gro-lite.

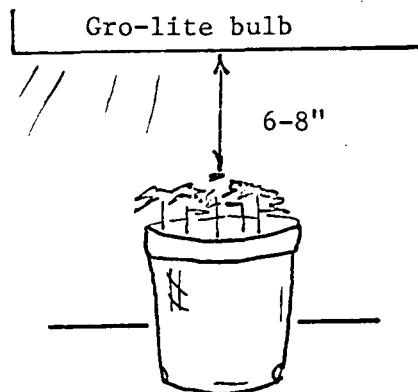
Gro-lite

33.

Each student should now place his pot in the aluminum pan under the Gro-lite. The Gro-lite bulb should be 6-8" from the plant tops.

Be sure all the pots have the correct label in them.

Set the Gro-lite timer for 14 hours of light daily.



If your classroom has windows, you can set the pots on a sunny (southern exposure) windowsill. Be sure to rotate the pots 1/4 turn daily.

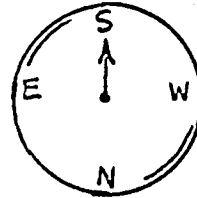
#34

The student will be able to determine which direction the classroom window faces.

compass

34.

To let the students figure out which way is south, and if their windows have a southern exposure, obtain a compass. Let each student determine which direction the windows face, using the compass.



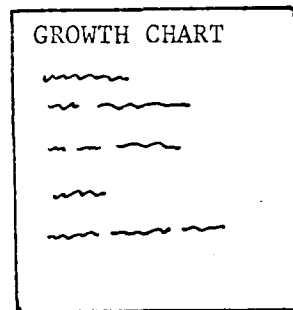
#35

The student will be able to verbally state what bud initiation is, and when it occurs on the Zinnias.

growth charts;
pencils or
markers

35.

Record the number of days from transplanting to bud initiation, on the growth charts. Bud initiation means that a tiny little flower bud is just visible in the "axil" of the leaf (see #42).



#36

The student will be able to water the pot of Zinnias correctly.

36.

Water the pot of seedlings when the pot begins to feel light to hold or when the soil seems fairly dry when you stick your finger into it. Follow the same watering procedures as for the Nasturtiums. Don't let the Zinnias dry out as much. They like a little more water.

#37

The student will be able to determine how much 1/2, 1, and 2 tsp. of fertilizer is.

measuring spoons; fertilizer

37.

Practice measuring fertilizer. Make sure all the students know how much 2 tsp.; 1 tsp.; and 1/2 tsp. of fertilizer are.



2 tsp.

1 tsp.

1/2 tsp.

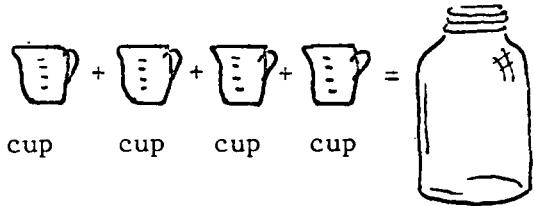
#38

The student will be able to measure and determine how much four cups of water is equal to.

quart jars; other size jars; measuring cups

38.

Now pour 1/2 tsp. of fertilizer into a quart jar of water. If students do not know what a quart is, teach them the concept by using a measuring cup and water. Let them measure 4 cups of water into different sized jars. The jar that is exactly filled by the 4 cups of water is a quart jar.



cup

cup

cup

cup

1 quart

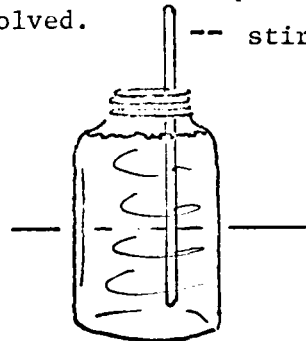
#39

The student will be able to mix the fertilizer in the water correctly.

stir rods

39.

Stir the fertilizer vigorously until all the blue particles are dissolved.



#40

The student will be able to fertilize the plants correctly.

#41

The student will be able to verbally explain why plants need fertilizer.

#42

The student will be able to verbally state what a bud and leaf axil are.

40.

Water the plants with this fertilizer solution until the pots are full. Allow to drain. Pour out the excess drain water. Be careful not to get fertilizer on the leaves, as it may burn them.



41.

Plants need nutrients in order to grow. Plants growing in confined pots often do not get the nutrient elements they need like plants growing in the wild. For this reason, and because the plant's soil may not have enough nutrients to support the plant's diet, regular feeding is necessary. Fertilizer feeds plants.

Fertilize the Zinnias once every three weeks.

42.

Watch carefully for flower bud initiation (first signs of a flower bud). The bud (first stage of a flower) will start to form in the "axil" of the leaf.



#43

The student will be able to determine the number of days from bud initiation to bloom.

growth charts;
pencils or
markers

The Thumbelina Zinnias will start to bloom when the plants are 3" high. This will take 1 1/2-2 months to occur. They will continue to bloom for a few months.

**Unlike Nasturtiums, people do not eat Zinnia flowers.

43.

Record how many days it takes for the plants to bloom after you first spot the little bud. Students should record this information on the growth charts.

Zinnia seeds can also be planted outside after danger of frost for beautiful color all summer long. Encourage students to try their hand at growing some other types of Zinnias outdoors at home.

VI. Related Events and Activities:

1. Take a field trip to a local nursery to observe the production and sale of spring bedding plants (plants grown in a greenhouse to be planted outdoors by the homeowner).
2. Transplant the extra Zinnia seedlings into small pots. When they bloom, wrap colorful foil and ribbon around the pots, and give away or sell.
3. Have simulated job interviews utilizing role-playing.
4. Set up a shop in the classroom, and let the students practice clerk skills.

VII. References and Teaching Aids:

1. Anonymous. 1974. A Child's Garden. Ortho Chemical Co., San Francisco, California.
2. Ball, G., Inc. 1975. The Ball Red Book. George J. Ball, Inc.
3. Hartman, H., and D. Kester. 1968. Plant Propagation - Principles and Practices. Prentice-Hall, Inc., Englewood Cliffs, New Jersey.
4. Heriteau, J. 1975. Easy Gardening Projects. Popular Library, New York.

APPENDIX 1d

I. Program Title: Prevocational Ornamental Horticulture for the
E.M.R. Student

II. Unit: Indoor Gardening in the Classroom

III. Topic: Making Coleus Cuttings

IV. Skills Involved in Completing Performance Objectives:

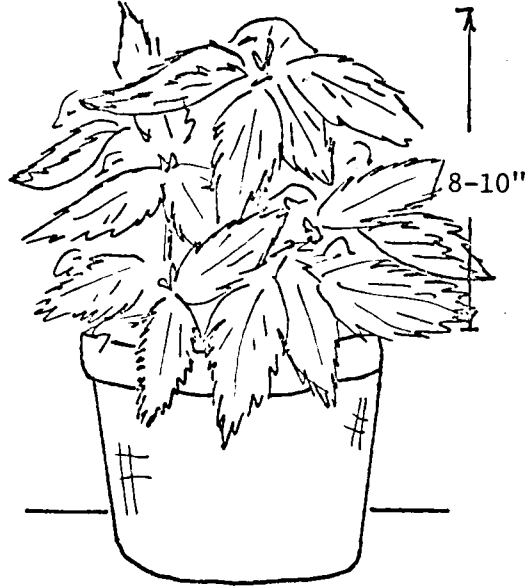
1. Gross motor coordination
2. Fine motor coordination
3. Simple judgement
4. Complex judgement
5. Visual perception
6. Mathematics
7. Memory
8. Verbalization
9. Writing

V. Teaching Outline

The teacher should complete the projects along with the students.

V. Teaching Outline

Performance Objectives	Materials	Information
<p>#1 The student will be able to identify a coleus plant.</p>	<p>coleus plant</p>	<p>1. The teacher should obtain a well-branched coleus plant at least 10" in height. Make sure the students can identify it.</p>
<p>#2 The student will be able to verbally identify and state the use of the following: label; Jiffy-Mix; wire cutters; Poly-Pak tray; potting soil; shards; fertilizer.</p>	<p>(see info)</p>	<p>2. Assemble the following, making sure all the students can identify and state the use of these items: pint Mason jars; lids to fit jars (vacuum, ring type); cardboard (1/32" thickness); cotton; scissors; pencils; grease pencils; quarters; sharp knives; 5 x 5" Poly-Pak trays; Jiffy-Mix; aluminum pan; labels; wire coat hangers; wire cutters; plastic bags; twist ties; sprinkler bottle; Gro-lite; potting soil; shards; 4" or 6" pots; fertilizer; measuring spoons; stir rods.</p>



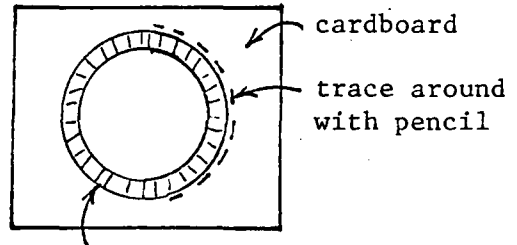
#3

The student will be able to trace a circle around his jar lid top onto cardboard, using a pencil.

cardboard;
pencils;
jar lids

3.

The students should prepare their jars in the following manner for rooting the coleus cuttings: have the students trace a circle around their lids onto the cardboard, using a pencil.



vacuum, ring type lid

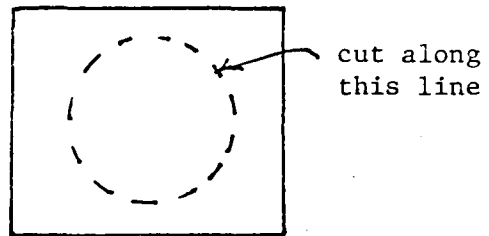
#4

The student will be able to cut out the disc of cardboard, using scissors.

scissors

4.

Each student should cut out the disc cardboard, using scissors.



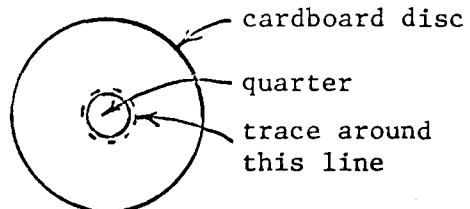
#5

The student will be able to trace a circle around a quarter onto the cardboard, using a pencil.

quarters;
pencils

5.

Each student should place a quarter in the center of his cardboard disc. Trace a circle around the quarter onto the cardboard, using a pencil.

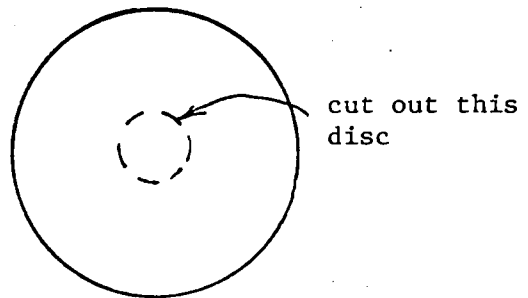


Top View

#6
The student will be able to cut out a quarter-size disc from the center of the cardboard using scissors.

scissors

6.
Have each student cut out this small disc, using a small, sharp pair of scissors.
**They may need assistance with this performance task.

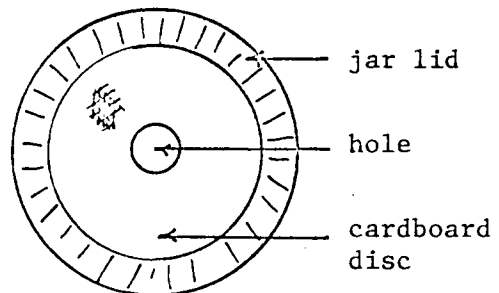


Top View

#7
The student will be able to fit the cardboard disc into the jar lid, making sure there is a snug fit.

jar lids

7.
Insert the cardboard disc into the jar lid, making sure there's a snug fit.

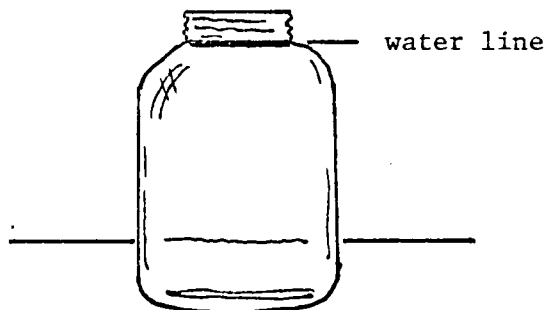


Top View

#8
The student will be able to determine how high to fill his jar with water.

jars

8.
Each student should fill his pint jar with water to the designated level.



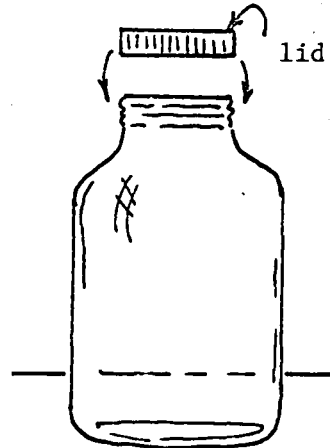
#9

The student will be able to correctly screw the lid on his jar.

jars; lids
with discs

9.

Each student should screw on their jar lids with the cardboard disc inserted.



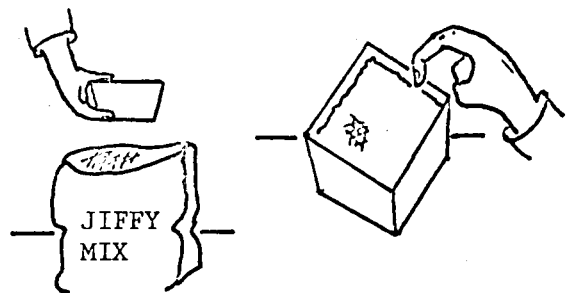
#10

The student will be able to correctly fill his Poly-Pak tray with Jiffy-Mix.

Poly-Pak
trays;
Jiffy-Mix

10.

The students should prepare the Poly-Pak trays in the following manner for rooting the coleus cuttings: have each student fill his Poly-Pak tray with Jiffy-Mix (refer to the lesson plan "Gardening with Zinnias" for procedures on how to do this).



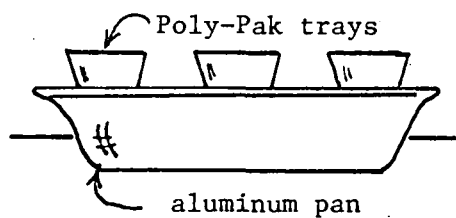
#11

The student will be able to correctly wet the Jiffy-Mix by means of sub-irrigation.

aluminum pan

11.

Wet the Jiffy-Mix by means of sub-irrigation (refer to the lesson plan "Gardening with Zinnias" for a review of this).

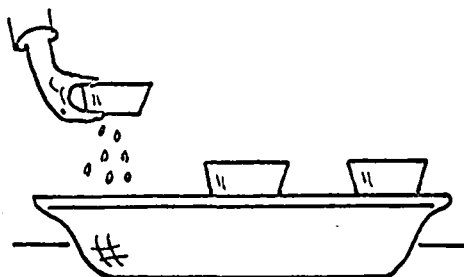


#12

The student will be able to correctly drain the Poly-Pak tray of Jiffy-Mix.

12.

Allow the trays of Jiffy-Mix to drain. Set the trays on a water-resistant surface.

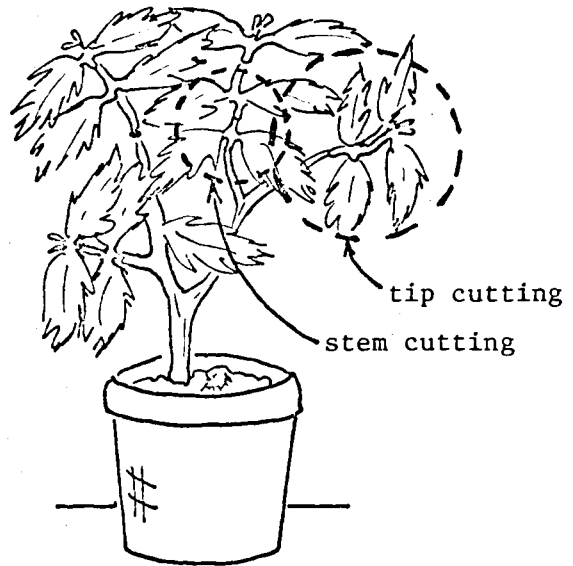


#13

The student will be able to verbally state what a cutting is.

13.

Each student should take 4 "cuttings" from the coleus plant. A cutting is a part of the "mother" plant, that when removed, will grow into a complete new plant just like the original mother plant.



"Mother" Plant

#14 a

The student will be able to state what a tip, and a stem cutting are, and will be able to correctly take one of each.

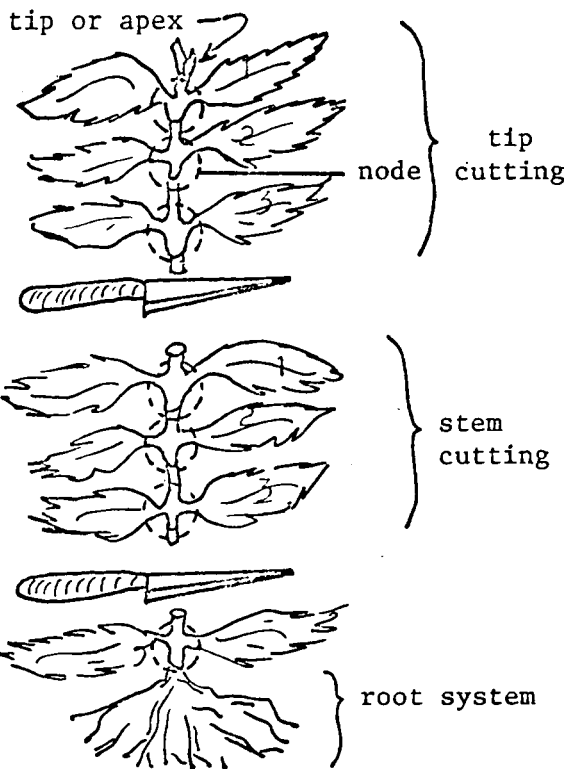
knives

14.

Each student should take a "tip" cutting, and 3 "stem" cuttings as shown. Use a small, sharp knife.

**Use this knife with care.

Make the cutting long enough. Take a cutting with 3 sets of leaves at least. Be sure you make the cut just below a "node". A node is the place on the stem where the leaves grow out. The node is where roots will form on most cuttings. Be sure you make a smooth, clean cut.



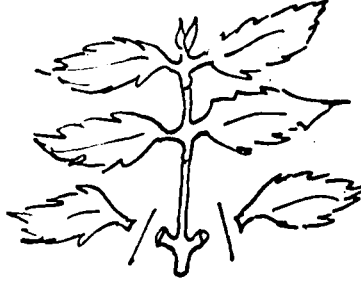
#15

The student will be able to correctly remove the bottom set of leaves from the cuttings.

knives

15.

Remove the bottom set of leaves from the cuttings, using a knife.



cut cut

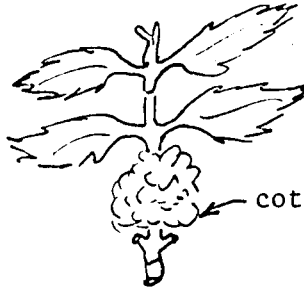
#16

The student will be able to wrap a small piece of cotton around the lower stem of the tip cutting.

cotton

16.

Each student should wrap a small piece of cotton around the lower part of the tip cutting's stem.



cotton

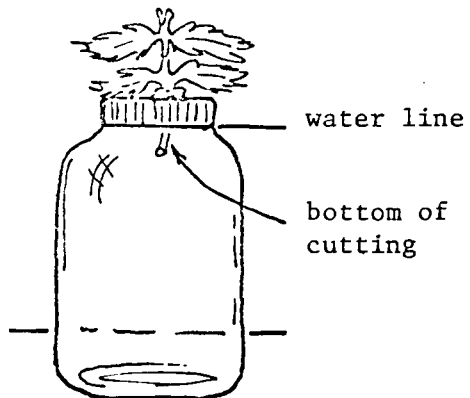
#17

The student will be able to correctly insert the wrapped cutting into the hole in the jar lid.

jars

17.

Insert the wrapped stem gently into the opening in the jar lid as indicated. The cotton should fit snugly into the hole, holding the cutting upright.



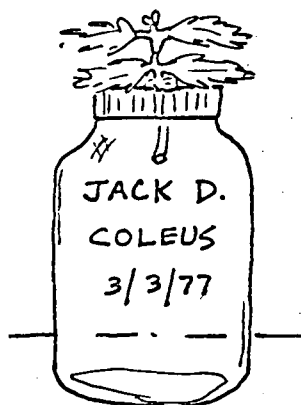
#18

The student will be able to correctly label his jar.

grease pencils

18.

Each student should write his name, coleus, and the date on the jar, using a grease pencil.



#19

The student will be able to correctly remove the jar lid, and keep the jar filled with water.

19.

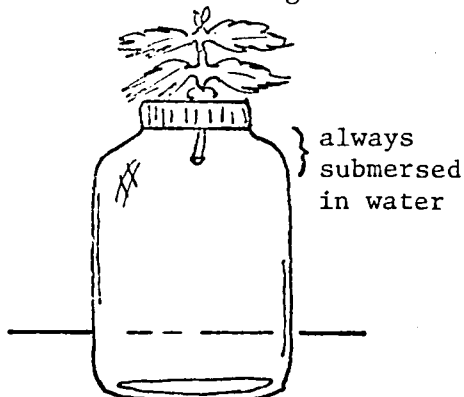
Make sure the end of the cutting's stem is always submersed in water. This is very important if rooting is to occur.

The students should carefully unscrew the lids (with the cuttings left in) to keep the jar filled with water.

**Be careful that the cardboard doesn't fall out when removing the lid.

If the water starts turning a greenish color, pour all the water out of the jar, and refill it with fresh water.

Observe the root growth.



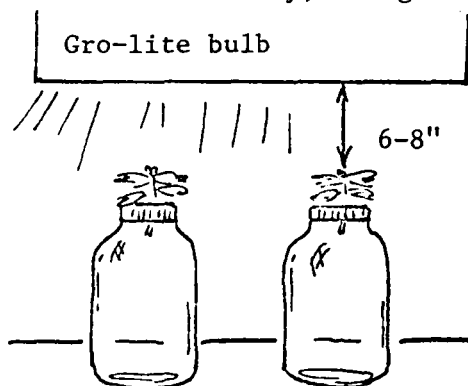
#20

The student will be able to correctly set the jar of cuttings under the Gro-lite.

Gro-lite;
timer

20.

Place the jars of cuttings under the Gro-lite. Set the timer for 14 hours of light daily. The tops of the cuttings should be 8-10" from the bulb. The jars may also be set on a windowsill. Remember to turn them 1/4 turn daily, though.



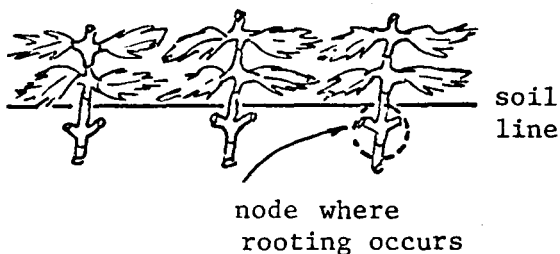
#21

The student will be able to correctly stick the stem cuttings into the Jiffy-Mix in the Poly-Pak tray.

stem cuttings;
trays of
Jiffy-Mix

21.

Each student should "stick" (grower's term meaning put the cutting's lower stem into the soil) his 3 stem cuttings into the Jiffy-Mix in the Poly-Pak tray as indicated. Make sure the cuttings are spread out in the tray.



Top View

#22

The student will be able to correctly write his name, coleus, and the date on a label.

labels;
pencils

22.

Each student should write his name, coleus, and the date on a label, using a pencil.

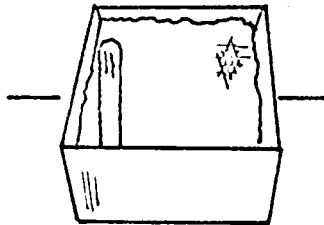


#23

The student will be able to correctly stick his label in the tray.

23.

Stick the label in the front, left-hand corner of the tray.



#24

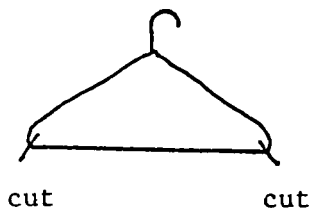
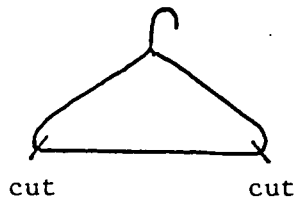
The student will be able to correctly cut a piece of coat-hanger, using wire cutters.

coat hangers;
wire cutters

24.

Taking 2 coat hangers, each student should cut the bottom portions off, using wire cutters.

**Be careful cutting the wire.



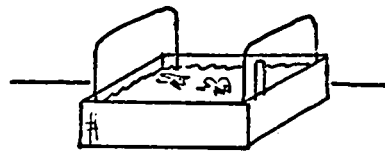
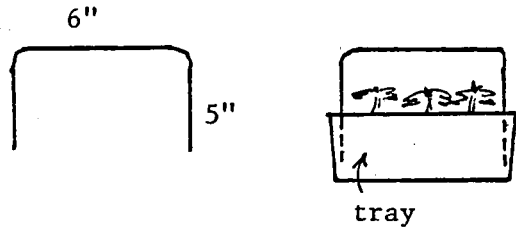
#25

The student will be able to correctly bend the wires, and place them in the Poly-Pak tray.

wire; trays
of cuttings

25.

Bend the wires as shown to fit into the Poly-Pak tray. Place the wires in the tray.



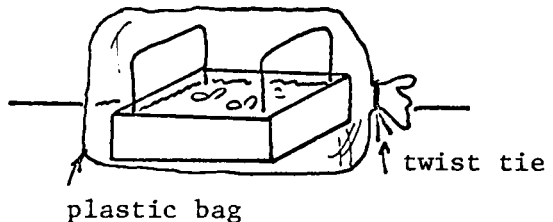
#26

The student will be able to correctly place the Poly-Pak tray in a plastic bag.

plastic bags;
twist ties

26.

Put the Poly-Pak tray into a plastic bag, as indicated. Seal the bag shut with a twist tie.



This creates a miniature greenhouse effect. The bag will hold moisture in, and keep the temperature warm. High humidity and warm temperatures are favorable rooting conditions.

If excessive beads of water start to form on the inside of the bag, open the bag and let fresh air in for an hour or so.

If the Jiffy-Mix starts to dry out, sprinkle it thoroughly with the sprinkler bottle.

#27

The student will be able to correctly set up the trays of cuttings under the Gro-lite.

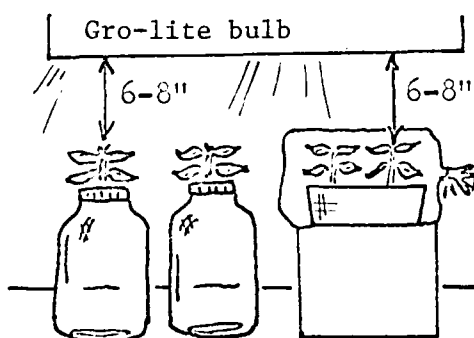
Gro-lite;
timer

27.

Set the trays of cuttings under the Gro-lite. Set the timer for 14 hours of light daily. The tops of the cuttings should be about 8-10" from the bulb.

You may have to prop the tray up on something, if the jars are under the same light, to keep the plant tops equidistant from the bulb.

The trays may also be placed on a windowsill. Remember to turn them daily.

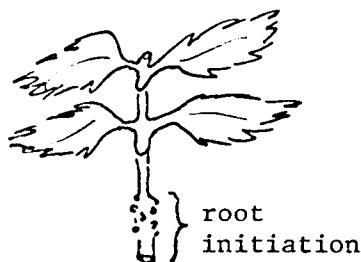


#28

The student will be able to determine by visual inspection when root initiation occurs.

28.

Pull one cutting very gently out of the soil each day to see if it has started to root. "Root initiation" (first signs of rooting) should occur in a couple days.



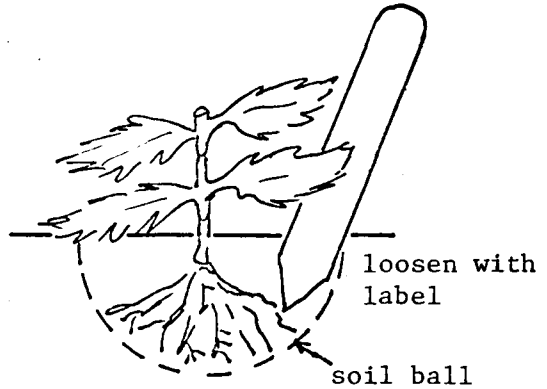
#29

The student will be able to verbally state what a soil ball is.

labels

29.

Once root initiation has begun, remove a cutting every 3 days to observe the root growth. As the roots get longer, you will have to gently remove the cutting by first loosening the "soil ball" (soil surrounding the roots) with a label so as not to injure the delicate root system.



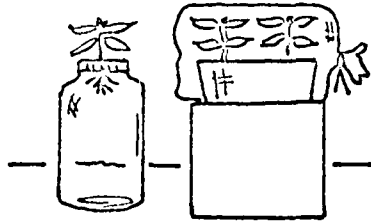
#30

The student will be able to keep comparative growth logs.

log books;
pens or
pencils

30.

Have the students keep growth logs, comparing the rooting of the coleus cutting in the jar to those in the Jiffy-Mix. Which roots the fastest? Which has more roots? Which has longer roots? Which has well-branched roots?



compare root growth

paper;
pencils

The students may want to make daily sketches, comparing root growths. Or, they may want to simply answer the questions above on a daily basis.

#31

The student will be able to determine when to transplant the cuttings.

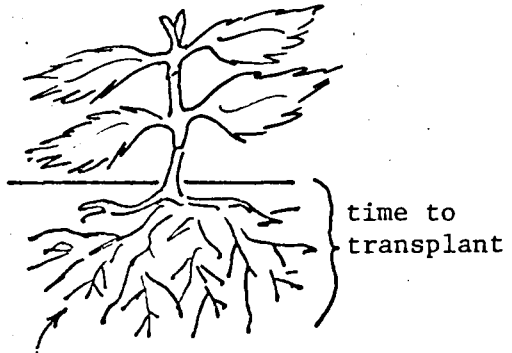
#32

The student will be able to determine how many cuttings to put in a 4", and a 6" pot.

4" or 6" pots

31.

When the cuttings have developed a good root system, it is time to transplant them.



full, well-branched root system

32.

Transplant the cuttings into pots as indicated below. Put one cutting in a 4" pot or 3 cuttings in a 6" pot. It's a good idea not to "overpot" a plant - that is, to put a plant in a pot that is too big for it.



4" pot



6" pot

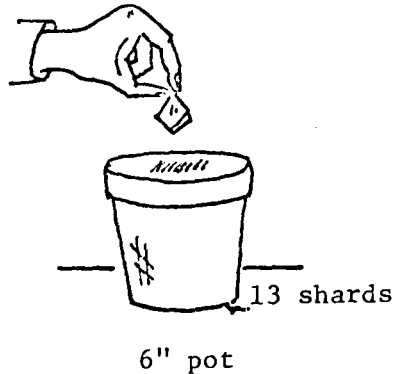
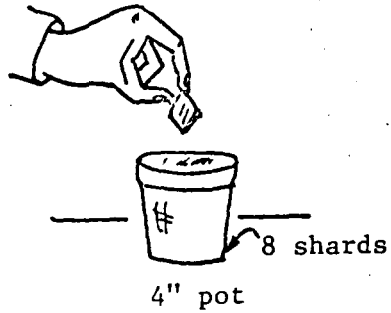
#33

The student will be able to count out the correct number of shards for his pot size.

shards

33.

Place 8 shards in the bottom of a 4" pot, or 13 shards in the bottom of a 6" pot.



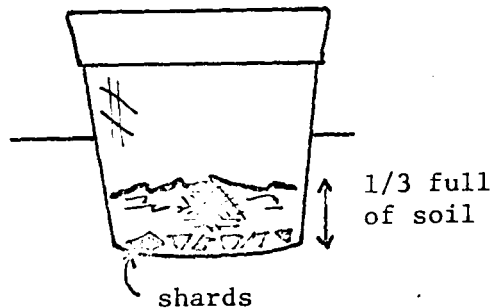
#34

The student will be able to fill his pot with potting soil to the correct level.

potting soil; sprinkler bottle

34.

Fill the pot 1/3 full of potting soil which has been moistened with water from the sprinkler bottle.



#35

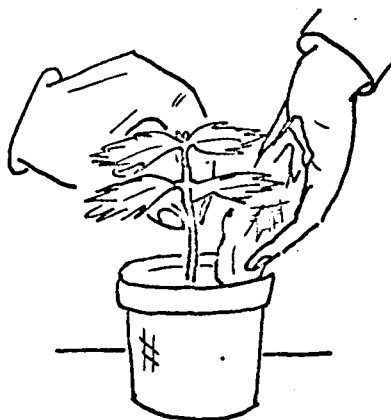
The student will be able to correctly fill around the cutting with soil.

#36

The student will be able to correctly firm the soil around the sides of the pot, and around the cutting.

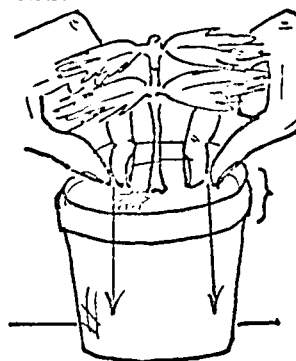
35.

Holding the coleus cutting by the stem with one hand, fill around the cutting with potting soil, using the other hand. Remember to plant the cutting the same depth as it was originally growing.

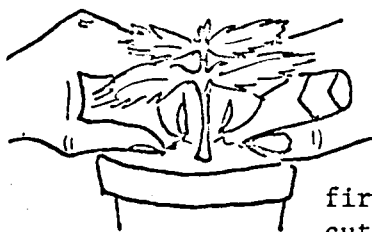


36.

Firm the soil around the sides of the pot, and around the cutting. Fill in with more soil if needed to obtain the correct soil level. Do not pack the soil.



1/2" from rim to soil line



firm around cutting

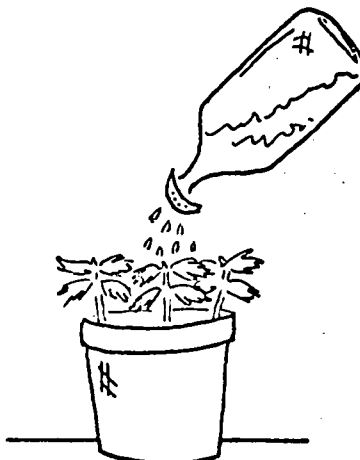
#37

The student will be able to correctly water-in the transplanted cuttings.

sprinkler
bottle

37.

Water-in the transplanted cuttings with the sprinkler bottle.



#38

The student will be able to demonstrate how to correctly water, fertilize, and care for the coleus plants.

Gro-lite;
timer

38.

Place the pots of coleus cuttings under the Gro-lite. Set the timer for 14 hours of light daily. The plant tops should be 6-8" from the bulb.

Or set the pots in a sunny windowsill, remembering to rotate the pots 1/4 turn daily. Coleus leaves get more colorful with lots of sunlight.

fertilizer;
measuring
spoons;
stir rods

Continue to water and fertilize the plants as for the transplanted Zinnia seedlings (refer to the lesson plan "Gardening with Zinnias").

Coleus can also be planted outdoors in early summer. It will die in the fall unless it is dug up, brought indoors, and transplanted.

VI. Related Events and Activities:

1. Obtain other plants to take cuttings from such as Swedish Ivy, Wandering Jew, Aluminum Plant, Velvet Plant, etc.
2. Explore plant propagation in more depth (refer to Principles and Practices of Plant Propagation by Hartman and Kester). Try multiplying plants by means of layering, division, and other types of cuttings.

VII. References and Teaching Aids:

1. Anonymous. 1974. A Child's Garden. Ortho Chemical Co.; San Francisco, California.
2. Hartman, H. and D. Kester. 1968. Plant Propagation - Principles and Practices. Prentice-Hall, Inc.; Englewood Cliffs, New Jersey.
3. Heriteau, J. 1975. Easy Gardening Projects. Popular Library; New York.

APPENDIX 1e

I. Program Title: Prevocational Ornamental Horticulture for the
E.M.R. Student

II. Unit: Indoor Gardening in the Classroom

III. Topic: Growing Cress for Salads

IV. Skills Involved in Completing Performance Objectives:

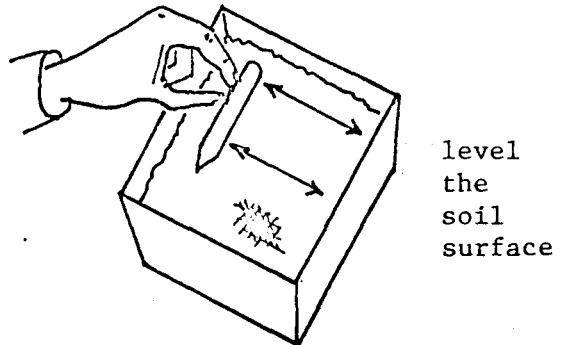
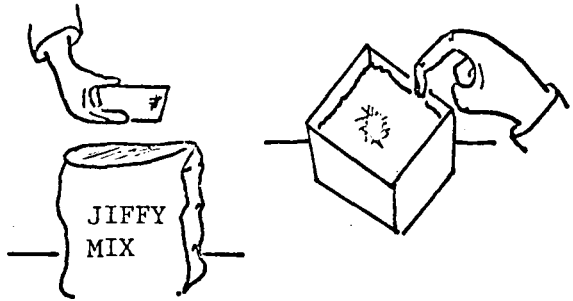
1. Gross motor coordination
2. Fine motor coordination
3. Simple judgement
4. Complex judgement
5. Visual perception
6. Mathematics
7. Memory
8. Verbalization
9. Writing

V. Teaching Outline

The teacher should complete the projects along with the students.

V. Teaching Outline

Performance Objectives	Materials	Information
<p>#1 The student will be able to correctly identify, and state the use of the following: Jiffy-Mix; curly cress seeds; label; 6 x 6" Poly-Pak tray.</p>	<p>(see info)</p>	<p>1. Assemble the following materials, making sure the students can identify and state the use of each of them: 6 x 6" Poly-Pak trays; Jiffy-Mix; labels; aluminum pan; jars; measuring spoons; rulers; curly cress seed; sprinkler bottle; pencils; plastic bags; twist ties; Gro-lite; thermometer; scissors.</p>
<p>#2 The student will be able to correctly fill his Poly-Pak tray with Jiffy-Mix.</p>	<p>6 x 6" Poly-Pak tray; Jiffy-Mix; ruler</p>	<p>2. Each student should fill a 6 x 6" Poly-Pak tray with Jiffy-Mix. Fill the tray to within an index finger nail's length of the rim (about 1/2").</p>
<p>#3 The student will be able to correctly level the surface of the Jiffy-Mix.</p>	<p>labels</p>	<p>3. Level the surface of the Jiffy-Mix using the side of a label.</p>



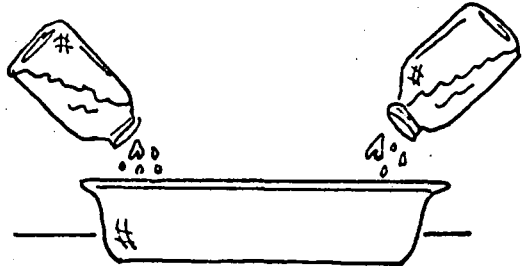
#4

The student will be able to correctly fill the aluminum pan with water.

aluminum pan;
jars

4.

Have two students fill the aluminum pan with water, using two jars.



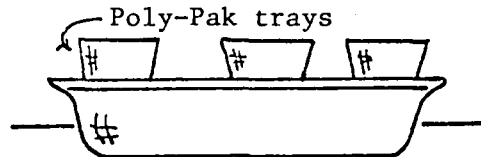
#5

The student will be able to correctly water the trays of Jiffy-Mix by means of sub-irrigation.

trays of
Jiffy-Mix

5.

Water the trays of Jiffy-Mix by sub-irrigating (refer to the lesson plan "Gardening with Zinnias").

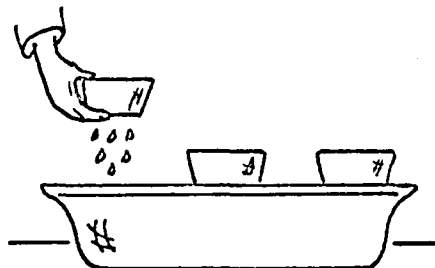


#6

The student will be able to drain the tray of Jiffy-Mix correctly.

6.

Carefully remove the trays from the water, holding them over the pan until they've drained of excess water. Set the trays on a water-resistant surface.



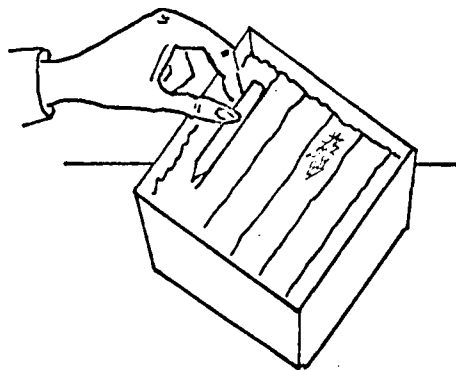
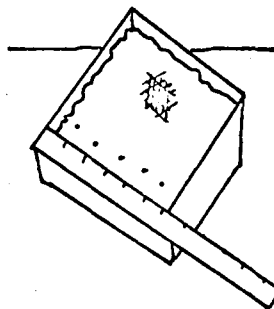
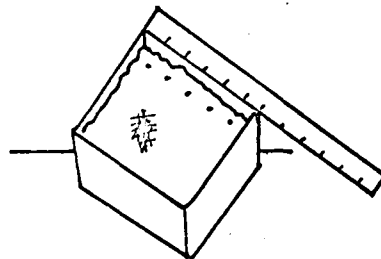
#7

The student will be able to correctly make five furrows in the Jiffy-Mix in the tray.

labels;
rulers

7.

Each student should make 5 straight furrows on top of the Jiffy-Mix, using a label. The furrows should be 1" apart, starting 1" from the edge of the tray. They should be 1/4" deep. Have the students use a ruler to mark the rows.



#8

The student will be able to correctly measure 1/2 tsp. of curly cress seeds.

measuring
spoons;
curly cress
seeds

8.

Each student should measure 1/2 tsp. of curly cress seeds for himself.



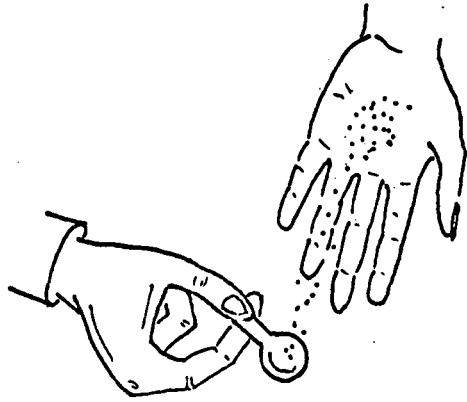
1/2 tsp. seeds

#9

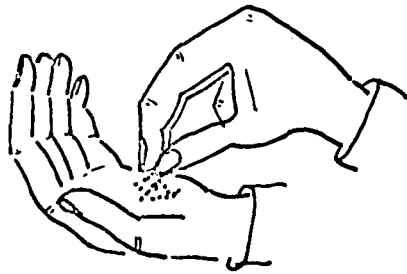
The student will be able to correctly sow the seeds in each furrow.

9.

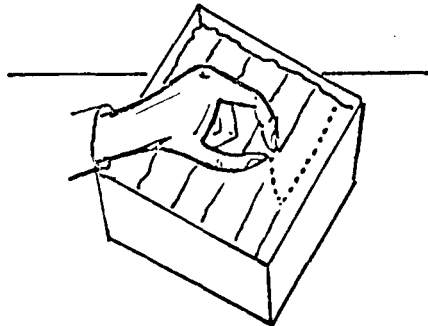
Pour these seeds into the left hand.



Take a pinch of seeds between the thumb and forefinger.



Sprinkle the pinch into one of the furrows, spacing the seeds about $\frac{1}{8}$ " apart. Continue this until all the seeds are sown in the furrows. Make sure the seeds have been sown in straight lines.



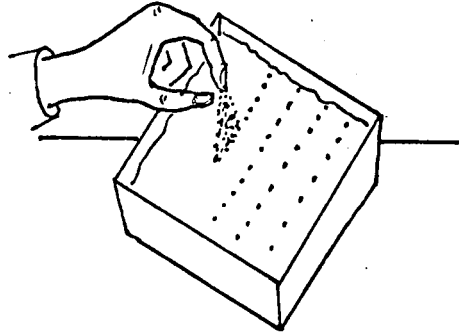
#10

The student will be able to correctly cover the furrows with Jiffy-Mix.

Jiffy-Mix

10.

Cover the furrows with a light cover of Jiffy-Mix (refer to this procedure in the lesson plan "Gardening with Zinnias").



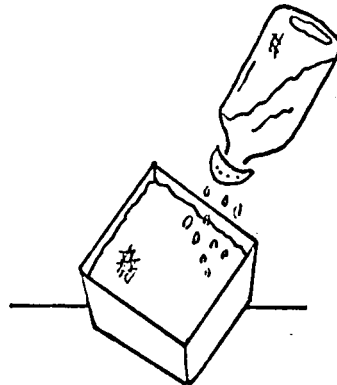
#11

The student will be able to correctly moisten the soil surface.

sprinkler bottle

11.

Moisten the soil surface with water, using the sprinkler bottle.



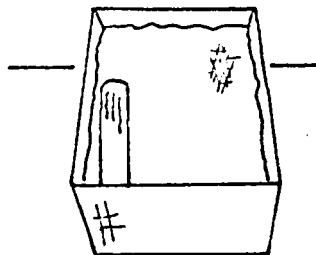
#12

The student will be able to correctly label his tray of curly cress seeds.

labels;
pencils

12.

Each student should write his name, curly cress, and the date on a label. Place the label in the front, left-hand corner of the tray.



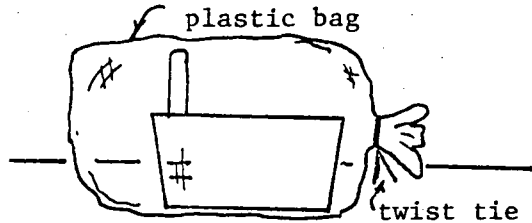
#13

The student will be able to correctly place the tray in the plastic bag.

plastic bags;
twist ties

13.

Place the tray in a clear plastic bag, securing the bag with a twist tie (refer to the lesson plan "Making Coleus Cuttings").



#14

The student will be able to verbally state how long to leave the tray in the plastic bag.

14.

Keep this bag around the tray for 2 days. It is not necessary to place the tray under the Gro-lite or on a sunny windowsill for these 2 days.

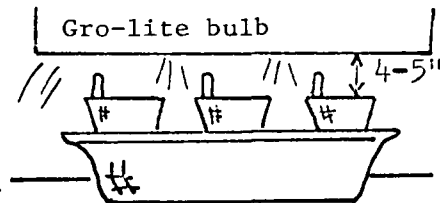
#15

The student will be able to correctly set up the Poly-Pak trays under the Gro-lite.

aluminum pan;
Gro-lite;
timer

15.

After 2 days, remove the bag. Set the Poly-Pak trays in the aluminum pan. Set the pan of trays under the Gro-lite. The bulb should be 4-5" from the top of the trays. Set the timer for 14 hours of light daily. You may also place the trays on a sunny windowsill. Remember to turn the trays, though.



#16

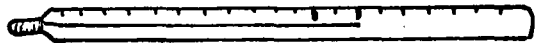
The student will be able to keep daily temperature charts.

thermometer; paper; pens or pencils

16.

Make sure the temperature around the trays is 65-70°F. Let the students measure the temperature each day to determine if it stays in this range. Have them keep daily temperature records.

65-70°F.



Temperature Record

3/4/77	68°	3/9/77	68°
3/5/77	70°	3/10/77	70°
3/6/77	67°	3/11/77	69°
3/7/77	66°	3/12/77	68°
3/8/77	66°	3/13/77	67°

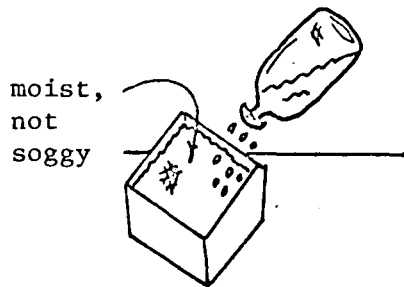
#17

The student will be able to determine how wet to keep the Jiffy-Mix.

sprinkler bottle

17.

Keep the Jiffy-Mix uniformly moist, but not soggy wet until the seedlings sprout (4-7 days). Water with the sprinkler bottle.



#18

The student will be able to adjust the Gro-lite to obtain proper plant growth.

18.

About lights: the Gro-lite will need to be raised as the stalks of cress grow taller. Normally, the bulb is kept 6-8" from the tops of the plants. However, if the stalks are growing tall (like asparagus stalks), with the leaves reaching upward to the light, the bulb should be closer. If, after you have lowered the

#19

The student will be able to correctly determine when to harvest the curly cress, and how to do this.

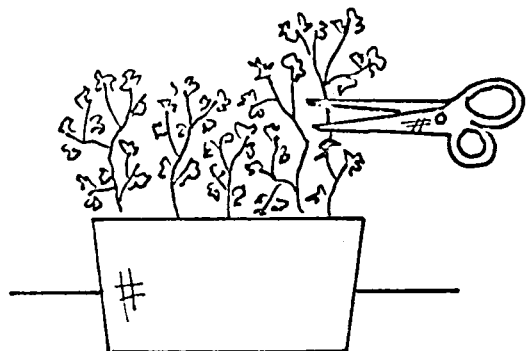
scissors

bulb, the plants continue to look "stretched-out", increase the time the light is on by 1/2 hour. If this doesn't work, make it an hour. On the other hand, if the seedlings have bunched leaves and hard centers - or if the leaves are losing color or have burned areas, there is too much light. Reduce the length of time the lights stay on. Raise the bulb height if that doesn't correct the situation.

19.

In 2-4 weeks after the seed is sown, the curly cress should be ready to cut and eat. Curly cress is tiny, and grows in slender stems. It has a finely cut leaf, resembling parsley, but tasting like watercress. A small amount of curly cress added to salads will add a distinctive flavor.

Snip a few stalks from each plant, using scissors.



VI. Related Events and Activities:

1. Try growing other vegetables and herbs such as radishes, lettuce, parsley, etc. (refer to Easy Gardening Projects by Heriteau, and How to Grow Herbs and Salad Greens Indoors by Mescheter).

VII. References and Teaching Aids:

1. Heriteau, J. 1975. Easy Gardening Projects. Popular Library; New York.
2. Mescheter, J. 1975. How to Grow Herbs and Salad Greens Indoors. Popular Library; New York.

APPENDIX 2

ATTITUDES' and SKILLS' EVALUATION

Name of student: _____ Age: _____

Psychological diagnosis
and prognosis: _____ I.Q.: _____
(most current score)

Previous training or work experience: _____ Interest in growing plants: _____

Name of teacher: _____

Teacher's background
and ability: _____

Area: Horticulture Date from: _____
to: _____

The rating terms used in this evaluation are purposely related to an employment situation. Behavioral attitudes and skills should be assessed as seen by an employer.

The following ratings with corresponding numerical values are to be used:

- 1 - unacceptable
- 2 - poor
- 3 - acceptable
- 4 - very good
- 5 - excellent

ATTITUDES' and SKILLS' EVALUATION

1 - unacceptable 4 - very good Please check as follows:
 2 - poor 5 - excellent 1 2 3 4 5
 3 - acceptable () () () () ()

I. Attitudes:

1. Social Interaction:

	1	2	3	4	5
a. Towards instructor	()	()	()	()	()
b. Towards others	()	()	()	()	()
c. Follows directions	()	()	()	()	()
d. Accepts criticism	()	()	()	()	()
e. Personal appearance	()	()	()	()	()

2. Work Attitudes:

	1	2	3	4	5
a. Motivation	()	()	()	()	()
b. Pride in work	()	()	()	()	()
c. Punctuality	()	()	()	()	()
d. Self-control	()	()	()	()	()
e. Attention span	()	()	()	()	()
f. Perserverance	()	()	()	()	()
g. Self-confidence	()	()	()	()	()

II. Skills:

1. Work skills:

	1	2	3	4	5
a. Speed	()	()	()	()	()
b. Quality	()	()	()	()	()
c. Stamina	()	()	()	()	()
d. Gross motor coordination	()	()	()	()	()
e. Fine motor coordination	()	()	()	()	()

2. Mental skills:

	1	2	3	4	5
a. Memory	()	()	()	()	()
b. Math	()	()	()	()	()
c. Verbal	()	()	()	()	()
d. Reading	()	()	()	()	()
e. Writing	()	()	()	()	()
f. Understanding	()	()	()	()	()
g. Simple judgement	()	()	()	()	()
h. Complex judgement	()	()	()	()	()

TOTAL SCORE: _____

Additional comments concerning
student's attitudes' and skills'
acquisition and progress.

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AN INVESTIGATION INTO HORTICULTURE AS A PREVOCATIONAL TRAINING TOOL
FOR THE E.M.R. STUDENT

By

Deborah Lee Chaves

(ABSTRACT)

A prevocational horticulture training program for the E.M.R. student enrolled in special education was developed, evaluated, and revised in this study. One E.M.R. special education class, comprised of four male E.M.R. students, participated in the study. The special education teacher, with the assistance of the researcher, executed and evaluated the instructional unit over a ten-week period.

Results of the study, based on a number of assessment procedures, indicated that the horticulture training program was an effective vocational instructional tool. It promoted good social and work attitudes, improved mental and work skills, increased motivation, and promoted a general knowledge of horticulture. Limitations of the study made it difficult to validly determine whether the horticulture instructional unit was the treatment responsible for the significant increase in student job skills' and attitudes' acquisition. In addition, the absence of follow-up studies made it difficult to assess the program's impact on the entry and success of the E.M.R. students into a regular vocational program.

After evaluations and recommendations were made, the instructional unit was revised to produce a usable product, step-by-step horticulture

instructional material for the E.M.R. student. The study provides a preliminary framework for further experimental investigation into the utilization of horticulture as a prevocational training tool for the E.M.R. student.